H. O. No. 208

NAVIGATION TABLES
FOR
MARINERS AND AVIATORS

—

FIFTH EDITION

DREISONSTOK

UNITED STATES NAVY DEPARTMENT
HYDROGRAPHIC OFFICE

VK
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HE Sawyer

The following two cases, illustrate the method of working problems with these tables. **Case I covers the majority of problems.** Sometimes, however, it will be necessary to use Case II.

Case I (L. H. A. between 0° and 90°, or 270° and 360°)

The U. S. S. *West Virginia* is making passage from the United States to Montevideo. At about 1650, on March 26, 1928, she was in D. R. position, latitude 31° 04′ .7 S., longitude 49° 35′ .7 W. At this time the sun was observed as follows: Watch $4^h\ 52^m\ 27^s$; C–W $2^h\ 47^m\ 17^s$; chronometer slow $12^m\ 28^s$; corrected observed altitude 18° 16.5′. Required the line of position.

	h	m	s	
W	4	52	27	
C–W	2	47	17	
Chron. face	7	39	44	
C. C	(+)12	28		
G. C. T. 26 March	19	52	12	
Eq. T	(−)5	41	.1	
G. A. T	19	46	30.9	*b*, takes the same name as the latitude.
Subtract	12			
G. H. A	=7	46	30.9 W.	
Arc	=116°	37.7′	W.	
Assumed long	(−)49	37.7	W.	

L. H. A. 67° W.

t 67° dec. 2° 21.0 N.

L 31° b 33 02.1 S.

$d+b$ 30 41.1′

A 21159	C 103	Z′	39.5°
B 29216	D 227	Z″	65.0°
A+B 50375	C+D 330	Z	104.5 S. and W.

h_c 18° 16.2′
h_o 18 16.5

a=0.3′ towards.

Case II (L. H. A. between 90° and 270°)

On May 15, 1928, about 8 p. m. the U. S. S. *Mississippi* making passage from Hampton Roads to Liverpool, while in D. R. position 40° 43′ N., 68° 30′ W., observed the star Vega as follows: W $7^h\ 36^m\ 12^s$; C–W $4^h\ 59^m\ 12^s$; chron. $1^m\ 1^s$ slow. True alt. 14° 50.5′.

	h	m	s	
W	7	36	12	
C–W	4	59	12	
Chron. face	12	35	24	
C. C	(+) 1	01		
G. C. T. 16 May	0	36	25	
R. A. M. S. ⊙	15	33	49.7	
Corr. G. C. T.			6.0	
G. S. T	16	10	20.7	*b*, takes the opposite name to the latitude and $d+b$ is always subtracted.
R. A. Vega	18	34	31.3	Z, is always obtained by subtraction.
G. H. A	21	35	49.4 W.	
Or arc	=323°	57.4′	W.	
Assum. long	(−)68	57.4	W.	

	h	m	s
or, G. C. T. 16 May	0	36	25
G. H. A. 16 May	314°	49.6	
Corr. $0^h\ 36^m$	9	01.5	
Corr. 25^s		6.3	
G. H. A.	323	57.4 W.	

L. H. A. 255° W. (or 105° E.).
Reject 180
(illustrates note 13 *b*).

t 75

t 75° dec. 38° 42.7′ N.

L 41° b 16 34.8 S.

$d+b$ 22 07.9

A 16461	C 137	Z′	(−)22.2°
B 42396	D 391	Z″	73.5
A+B 58857	C+D 528	Z	51.3 N. and E.

h_c 14° 56.7′
h_o 14 50.5

a=6.2 (away).

CORRECTIONS TO OBSERVED ALTITUDE OF SUN, STARS, AND MOON

Obs. Alt.	Sun or star
°	′
6	−8
7	7
8	6
9	6
10	5
11	−5
12	5
13	4
14	4
15	3
16	−3
17	3
18	3
19	3
20	3
22	2
24	−2
26	2
28	2
30	2
32	2
34	−2
36	1
38	1
40	1
45	1
50	1
55	−1
60	1
65	1
70	−1
75	0
80	0
85	0
90	0

MOON

Obs. Alt.	Hor. parallax				Obs. Alt.	Hor. parallax			
	54′	56′	58′	60′		54′	56′	58′	60′
°	′	′	′	′	°	′	′	′	′
5. 5	+45	+47	+49	+51	46	+37	+38	+40	+41
6. 0	45	47	49	51	47	36	37	39	40
6. 5	46	48	50	52	48	35	37	38	39
7. 0	46	48	50	52	49	35	36	37	39
7. 5	47	49	51	53	50	34	35	37	38
8. 0	+47	+49	+51	+53	51	+33	+34	+36	+37
8. 5	47	49	51	53	52	33	34	35	36
9. 0	48	50	52	54	53	32	33	34	35
9. 5	48	50	52	54	54	31	32	34	35
10	48	50	52	54	55	30	32	33	34
11	+48	+50	+52	+54	56	+30	+31	+32	+33
12	49	50	52	54	57	29	30	31	32
13	49	51	53	54	58	28	29	30	31
14	49	51	53	54	59	27	28	29	30
15	49	51	53	54	60	27	28	29	30
16	+49	+51	+53	+54	61	+26	+27	+28	+29
17	49	51	52	54	62	25	26	27	28
18	48	50	52	54	63	24	25	26	27
19	48	50	52	54	64	23	24	25	26
20	48	50	52	54	65	23	23	24	25
21	+48	+50	+52	+54	66	+22	+22	+23	+24
22	48	50	52	53	67	21	22	22	23
23	48	49	51	53	68	20	21	22	22
24	47	49	51	53	69	19	20	21	21
25	47	49	51	52	70	18	19	20	20
26	+47	+48	+50	+52	71	+17	+18	+19	+19
27	46	48	50	52	72	16	17	18	18
28	46	48	50	51	73	16	16	17	17
29	46	47	49	51	74	15	15	16	16
30	45	47	49	50	75	14	14	15	15
31	+45	+46	+48	+50	76	+13	+13	+14	+14
32	44	46	48	49	77	12	12	13	13
33	44	46	47	49	78	11	12	12	12
34	43	45	47	48	79	10	11	11	11
35	43	44	46	48	80	9	10	10	10
36	+42	+44	+46	+47	81	+8	+9	+9	+9
37	42	44	45	47	82	8	8	8	8
38	41	43	45	46	83	7	7	7	7
39	41	42	44	46	84	6	6	6	6
40	40	42	43	45	85	5	5	5	5
41	+40	+41	+43	+44	86	+4	+4	+4	+4
42	39	41	42	44	87	3	3	3	3
43	39	40	42	43	88	2	2	2	2
44	38	39	41	42	89	1	1	1	1
45	+37	+39	+40	+42	90	0	0	0	0

Note.—This table must not be used for altitudes measured on the horizon.

Corrections to Observed Altitudes of Sun Star or Planet
Table III
Table I
Table II
Explanation of the Construction and Use of Tables

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AVIATOR'S TIME-SPEED-DISTANCE TABLE

Time,	Speed in knots or miles per hour													
m	40	50	60	70	75	80	85	90	95	100	105	110	120	150
1	0.7	0.8	1	1.2	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.8	2	2.5
2	1.3	1.7	2	2.3	2.5	2.7	2.8	3.0	3.2	3.3	3.5	3.7	4	5.0
3	2	2.5	3	3.5	3.8	4.0	4.2	4.5	4.7	5.0	5.3	5.5	6	7.5
4	2.7	3.3	4	4.7	5	5.3	5.6	6	6.3	6.7	7	7.3	8	10
5	3.3	4.2	5	5.8	6.3	6.7	7.1	7.5	7.9	8.3	8.8	9.2	10	12.5
6	4	5	6	7	7.5	8	8.5	9	9.5	10	10.5	11	12	15
7	4.7	5.8	7	8.2	8.8	9.3	9.9	10.5	11.1	11.7	12.3	12.8	14	17.5
8	5.3	6.7	8	9.3	10	10.7	11.3	12	12.6	13.3	14	14.7	16	20
9	6	7.5	9	10.5	11.3	12	13	13.5	14.2	15	15.8	16.5	18	22.5
10	6.7	8.3	10	11.7	12.5	13.3	14.1	15	15.8	17	17.5	18.3	20	25
11	7.3	9	11	13	14	15	15.5	16.5	17	18	19	20	22	28
12	8	10	12	14	15	16	17	18	19	20	21	22	24	30
13	8.7	11	13	15	16	17	18	20	21	22	23	24	26	33
14	9.3	12	14	16	18	19	20	21	22	23	25	26	28	35
15	10	12	15	17	19	20	21	23	24	25	26	27	30	38
16	10.7	13	16	19	20	21	23	24	25	27	28	29	32	40
17	11.3	14	17	20	21	23	24	26	27	28	30	31	34	43
18	12	15	18	21	23	24	25	27	28	30	32	33	36	45
19	12.7	16	19	22	24	25	27	29	30	32	33	35	38	48
20	13	17	20	23	25	27	28	30	32	33	35	37	40	50
21	14	17	21	24	26	28	30	32	33	35	37	38	42	53
22	15	18	22	26	28	29	31	33	35	37	39	40	44	55
23	15	19	23	27	29	31	32	35	36	38	40	42	46	58
24	16	20	24	28	30	32	34	36	38	40	42	44	48	60
25	17	21	25	29	31	33	35	38	40	42	44	46	50	63
26	17	22	26	30	33	35	37	39	41	43	46	48	52	65
27	18	22	27	31	34	36	38	41	43	45	47	49	54	68
28	19	23	28	32	35	37	39	42	44	47	49	51	56	70
29	19	24	29	34	36	39	41	44	46	48	51	53	58	73
30	20	25	30	35	38	40	42	45	47	50	53	55	60	75
31	21	26	31	36	39	41	44	47	49	51	54	57	62	78
32	21	27	32	37	40	43	45	48	51	53	56	59	64	80
33	22	27	33	38	41	44	47	50	52	55	58	60	66	83
34	23	28	34	39	43	45	48	51	54	56	60	62	68	85
35	23	29	35	41	44	47	49	53	55	58	61	64	70	88
36	24	30	36	42	45	48	51	54	57	60	63	66	72	90
37	25	31	37	43	46	49	52	56	58	61	65	68	74	93
38	25	32	38	44	48	51	54	57	60	63	67	70	76	95
39	26	32	39	45	49	52	55	59	61	65	68	71	78	98
40	27	33	40	46	50	53	56	60	63	66	70	73	80	100
41	27	34	41	48	51	55	58	62	65	68	72	75	82	103
42	28	35	42	49	53	56	59	63	66	70	74	77	84	105
43	29	36	43	50	54	57	61	64	68	71	75	79	86	108
44	29	37	44	51	55	59	62	66	70	73	77	81	88	110
45	30	37	45	52	56	60	63	68	71	75	79	82	90	113
46	31	38	46	53	58	61	65	69	73	76	81	84	92	115
47	31	39	47	55	59	63	66	71	74	78	82	86	94	118
48	32	40	48	56	60	64	68	72	76	80	84	88	96	120
49	33	41	49	57	61	65	69	74	77	81	86	90	98	123
50	33	42	50	58	63	67	71	75	79	83	88	92	100	125
51	34	42	51	59	64	68	72	77	81	85	89	93	102	128
52	35	43	52	60	65	69	73	78	82	86	91	95	104	130
53	35	44	53	61	66	70	75	80	84	88	93	97	106	133
54	36	45	54	63	68	72	76	81	85	90	95	99	108	135
55	37	46	55	64	69	73	78	83	87	91	96	101	110	138
56	37	46	56	65	70	74	79	84	88	93	98	102	112	140
57	38	47	57	66	71	76	80	86	90	95	100	104	114	143
58	39	48	58	67	73	77	82	87	92	96	102	106	116	145
59	39	49	59	69	74	78	83	89	93	98	103	108	118	148
60	40	50	60	70	75	80	85	90	95	100	105	110	120	150

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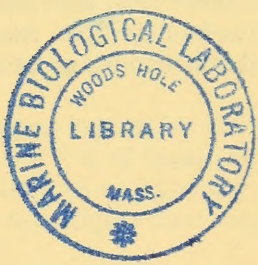

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Corrections to Observed Altitudes of Sun Star or Planet

Table III

Table I

Table II

Explanation of the Construction and Use of Tables

STATUTES OF AUTHORIZATION

There shall be a hydrographic office attached to the Bureau of Navigation in the Navy Department for the improvement of the means for navigating safely the vessels of the Navy and of the mercantile marine by providing, under the authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions for the use of all vessels of the United States, and for the benefit and use of navigators generally. (R. S. 431.)

The Secretary of the Navy is authorized to cause to be prepared, at the Hydrographic Office attached to the Bureau of Navigation in the Navy Department, maps, charts, and nautical books relating to and required in navigation, and to publish and furnish them to navigators at the cost of printing and paper, and to purchase the plates and copyrights of such existing maps, charts, navigators, sailing directions, and instructions as he may consider necessary, and when he may deem it expedient to do so, and under such regulations and instructions as he may prescribe. (R. S. 432.)

PREFACE

These tables were conceived, and the method and formulas deduced, by Lieut. Commander J. Y. Dreisonstok, United States Navy, while a member of the Naval Examining Board, Navy Department, Washington, D. C. This officer was later attached to the Division of Nautical Research of the Hydrographic Office, where he completed the calculations and put them into the present form.

Commander F. H. Roberts, United States Navy, of the Hydrographic Office, contributed valuable suggestions and criticisms in the preparation and revision of the book.

Acknowledgment is made for the constructive criticisms submitted by the fleet, the United States Naval Academy, and other sources. The work of revising the fifth edition was performed by Mr. Elmer B. Collins of the Hydrographic Office.

These tables are designed to facilitate the navigation of aircraft and surface craft. Used with the Nautical Almanac, no other books are required.

The method of solving navigational problems here given is applied to all problems regardless of the position of the heavenly body, be it sun, moon, planet, or star. It requires few figures and gives a quick solution for determining (*a*) line of position, (*b*) compass error, (*c*) meridian altitude, (*d*) Great Circle course and distance, (*e*) identification of unknown stars. The accuracy of the azimuth data fully justifies its use in obtaining compass error. The tables are simple to use.

While a small and handy size is desirable, space is given at the end of the book to a full explanation of the construction of these tables, together with numerous problems, in order that an opportunity for analysis may be afforded those who desire to investigate their soundness and uses.

W. R. Gherardi,
Rear Admiral, U. S. Navy,
Hydrographer.

MARINE BIOLOGICAL LABORATORY
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Corrections to Observed Altitudes of Sun Star or Planet
Table III
Table I
Table II
Explanation of the Construction and Use of Tables

Conversion of Time into Arc and Vice Versa

	0h	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h
m	°	°	°	°	°	°	°	°	°	°	°	°
0	0	15	30	45	60	75	90	105	120	135	150	165
4	1	16	31	46	61	76	91	106	121	136	151	166
8	2	17	32	47	62	77	92	107	122	137	152	167
12	3	18	33	48	63	78	93	108	123	138	153	168
16	4	19	34	49	64	79	94	109	124	139	154	169
20	5	20	35	50	65	80	95	110	125	140	155	170
24	6	21	36	51	66	81	96	111	126	141	156	171
28	7	22	37	52	67	82	97	112	127	142	157	172
32	8	23	38	53	68	83	98	113	128	143	158	173
36	9	24	39	54	69	84	99	114	129	144	159	174
40	10	25	40	55	70	85	100	115	130	145	160	175
44	11	26	41	56	71	86	101	116	131	146	161	176
48	12	27	42	57	72	87	102	117	132	147	162	177
52	13	28	43	58	73	88	103	118	133	148	163	178
56	14	29	44	59	74	89	104	119	134	149	164	179

	0m	1m	2m	3m
s	′	′	′	′
0	0	15	30	45
4	1	16	31	46
8	2	17	32	47
12	3	18	33	48
16	4	19	34	49
20	5	20	35	50
24	6	21	36	51
28	7	22	37	52
32	8	23	38	53
36	9	24	39	54
40	10	25	40	55
44	11	26	41	56
48	12	27	42	57
52	13	28	43	58
56	14	29	44	59

	12h	13h	14h	15h	16h	17h	18h	19h	20h	21h	22h	23h
m	°	°	°	°	°	°	°	°	°	°	°	°
0	180	195	210	225	240	255	270	285	300	315	330	345
4	181	196	211	226	241	256	271	286	301	316	331	346
8	182	197	212	227	242	257	272	287	302	317	332	347
12	183	198	213	228	243	258	273	288	303	318	333	348
16	184	199	214	229	244	259	274	289	304	319	334	349
20	185	200	215	230	245	260	275	290	305	320	335	350
24	186	201	216	231	246	261	276	291	306	321	336	351
28	187	202	217	232	247	262	277	292	307	322	337	352
32	188	203	218	233	248	263	278	293	308	323	338	353
36	189	204	219	234	249	264	279	294	309	324	339	354
40	190	205	220	235	250	265	280	295	310	325	340	355
44	191	206	221	236	251	266	281	296	311	326	341	356
48	192	207	222	237	252	267	282	297	312	327	342	357
52	193	208	223	238	253	268	283	298	313	328	343	358
56	194	209	224	239	254	269	284	299	314	329	344	359

	0m	1m	2m	3m
s	′	′	′	′
0	0	15	30	45
4	1	16	31	46
8	2	17	32	47
12	3	18	33	48
16	4	19	34	49
20	5	20	35	50
24	6	21	36	51
28	7	22	37	52
32	8	23	38	53
36	9	24	39	54
40	10	25	40	55
44	11	26	41	56
48	12	27	42	57
52	13	28	43	58
56	14	29	44	59

s	′
0. 4	0. 1
0. 8	0. 2
1. 2	0. 3
1. 6	0. 4
2. 0	0. 5
2. 4	0. 6
2. 8	0. 7
3. 2	0. 8
3. 6	0. 9
4. 0	1. 0

Height of eye (feet)	Corr.	Height of eye (feet)	Corr.
	′		′
200	−13. 9	1, 500	−38. 0
250	−15. 5	2, 000	−43. 8
300	−17. 0	2, 250	−46. 5
400	−19. 6	2, 500	−49. 0
500	−21. 9	2, 750	−51. 4
600	−24. 0	3, 000	−53. 7
750	−26. 8	3, 250	−55. 8
800	−27. 7	3, 500	−58. 0
1, 000	−31. 0	3, 750	−60. 0
1, 250	−34. 6	4, 000	−62. 0

CORRECTIONS TO BE APPLIED TO THE OBSERVED ALTITUDE OF A STAR OR OF THE SUN'S LOWER LIMB, TO FIND THE TRUE ALTITUDE

TABLE A

Observed altitude	☉ Sun's corr.	★ Star's corr.
° ′	′	′
6 30	+ 8.2	−7.9
6 40	8.4	7.7
6 50	8.6	7.6
7 0	8.7	7.4
7 10	8.9	7.2
7 20	+ 9.0	−7.1
7 30	9.2	7.0
7 40	9.3	6.8
7 50	9.5	6.7
8 0	9.6	6.6
8 10	+ 9.7	−6.4
8 20	9.8	6.3
8 30	10.0	6.2
8 40	10.1	6.1
8 50	10.2	6.0
9 0	+10.3	−5.9
9 20	10.5	5.7
9 40	10.6	5.5
10 0	10.8	5.3
10 20	11.0	5.2
10 40	+11.2	−5.0
11 0	11.3	4.9
11 30	11.5	4.7
12 0	11.7	4.5
12 30	11.9	4.3
13 0	+12.0	−4.1
13 30	12.2	4.0
14 0	12.3	3.8
15 0	12.6	3.6
16 0	12.8	3.4
17 0	+13.0	−3.2
18 0	13.2	3.0
19 0	13.3	2.8
20 0	13 5	2.6
22 0	13.7	2.4
24 0	+14.0	−2.2
26 0	14.1	2.0
28 0	14.3	1.8
30 0	14.4	1.7
32 0	14.6	1.6
34 0	+14.7	−1.4
36 0	14.8	1.3
38 0	14.9	1.3
40 0	15.0	1.2
45 0	15.1	1.0
50 0	+15.3	−0.8
55 0	15.4	0.7
60 0	15.5	0.6
65 0	15.6	0.5
70 0	15.7	0.4
75 0	+15.8	−0.3
80 0	15.8	0.2
85 0	15.9	−0.1
90 0	+16.0	0.0

Date	☉ Additional sun's corr.
	′
Jan. 1	+0.3
15	+0.3
Feb. 1	+0.3
15	+0.2
Mar. 1	+0.2
15	+0.1
Apr. 1	0.0
15	0.0
May 1	−0.1
15	−0.1
June 1	−0.2
15	−0.2
July 1	−0.2
15	−0.2
Aug. 1	−0.2
15	−0.2
Sept. 1	−0.1
15	−0.1
Oct. 1	0.0
15	+0.1
Nov. 1	+0.2
15	+0.2
Dec. 1	+0.3
15	+0.3
31	+0.3

TABLE B

Correction for height of eye	
Height of eye (feet)	Corr.
	′
0	0.0
1	−1.0
2	1.4
3	1.7
4	2.0
5	−2.2
6	2.4
7	2.6
8	2.8
9	2.9
10	−3.1
11	3.2
12	3.4
13	3.5
14	3.7
15	−3.8
16	3.9
17	4.0
18	4.1
19	4.3
20	−4.4
21	4.5
22	4.6
23	4.7
24	4.8
25	−4.9
26	5.0
27	5.1
28	5.2
29	5.3
30	−5.4
31	5.4
32	5.5
33	5.6
34	5.7
35	−5.8
37	6.0
39	6.1
41	6.3
43	6.4
45	−6.6
47	6.7
49	6.9
51	7.0
53	7.1
55	−7.3
60	7.6
65	7.9
70	8.2
75	8.5
80	−8.8
85	9.0
90	9.3
95	9.6
100	−9.8

TABLE C

FOR REFRACTION, PARALLAX, AND SEMIDIAMETER.

Obs. Alt. Lower Limb.	Lower Limb. Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
5. 5	+59. 6	+60. 9	+62. 1	+63. 4	+64. 7	+66. 0	+67. 3	+68. 5
6. 0	60. 2	61. 4	62. 7	64. 0	65. 3	66. 5	67. 8	69. 1
6. 5	60. 7	61. 9	63. 2	64. 5	65. 8	67. 0	68. 3	69. 6
7. 0	61. 1	62. 4	63. 6	64. 9	66. 2	67. 4	68. 7	70. 0
7. 5	61. 5	62. 7	64. 0	65. 3	66. 5	67. 8	69. 1	70. 4
8. 0	+61. 8	+63. 1	+64. 3	+65. 6	+66. 9	+68. 1	+69. 4	+70. 7
8. 5	62. 1	63. 3	64. 6	65. 9	67. 1	68. 4	69. 7	70. 9
9. 0	62. 3	63. 6	64. 8	66. 1	67. 4	68. 6	69. 9	71. 1
9. 5	62. 5	63. 8	65. 0	66. 3	67. 6	68. 8	70. 1	71. 3
10. 0	62. 7	64. 0	65. 2	66. 5	67. 7	69. 0	70. 3	71. 5
11	+63. 0	+64. 2	+65. 5	+66. 7	+68. 0	+69. 3	+70. 5	+71. 8
12	63. 2	64. 4	65. 7	66. 9	68. 2	69. 5	70. 7	72. 0
13	63. 3	64. 6	65. 8	67. 0	68. 3	69. 6	70. 8	72. 1
14	63. 4	64. 6	65. 9	67. 1	68. 4	69. 6	70. 9	72. 1
15	63. 4	64. 6	65. 9	67. 1	68. 4	69. 6	70. 9	72. 1
16	+63. 4	+64. 6	+65. 8	+67. 1	+68. 3	+69. 6	+70. 8	+72. 0
17	63. 3	64. 5	65. 8	67. 0	68. 2	69. 5	70. 7	71. 9
18	63. 2	64. 4	65. 6	66. 9	68. 1	69. 3	70. 6	71. 8
19	63. 1	64. 3	65. 5	66. 7	67. 9	69. 2	70. 4	71. 6
20	62. 9	64. 1	65. 3	66. 5	67. 8	69. 0	70. 2	71. 4
21	+62. 7	+63. 9	+65. 1	+66. 3	+67. 5	+68. 7	+70. 0	+71. 2
22	62. 5	63. 7	64. 9	66. 1	67. 3	68. 5	69. 7	70. 9
23	62. 2	63. 4	64. 6	65. 9	67. 0	68. 2	69. 4	70. 6
24	62. 0	63. 1	64. 3	65. 5	66. 7	67. 9	69. 1	70. 3
25	61. 7	62. 9	64. 0	65. 2	66. 4	67. 6	68. 8	69. 9
26	+61. 3	+62. 5	+63. 7	+64. 9	+66. 0	+67. 2	+68. 4	+69. 6
27	61. 0	62. 2	63. 3	64. 5	65. 7	66. 8	68. 0	69. 2
28	60. 7	61. 8	63. 0	64. 1	65. 3	66. 4	67. 6	68. 8
29	60. 3	61. 4	62. 6	63. 7	64. 9	66. 0	67. 2	68. 4
30	59. 9	61. 0	62. 2	63. 3	64. 4	65. 6	66. 7	67. 9
31	+59. 5	+60. 6	+61. 7	+62. 9	+64. 0	+65. 1	+66. 3	+67. 4
32	59. 0	60. 2	61. 3	62. 4	63. 5	64. 7	65. 8	66. 9
33	58. 6	59. 7	60. 8	61. 9	63. 1	64. 2	65. 3	66. 4
34	58. 1	59. 2	60. 3	61. 4	62. 5	63. 6	64. 8	65. 9
35	57. 7	58. 7	59. 8	60. 9	62. 0	63. 1	64. 2	65. 3
36	+57. 2	+58. 2	+59. 3	+60. 4	+61. 5	+62. 6	+63. 7	+64. 7
37	56. 7	57. 7	58. 8	59. 8	60. 9	62. 0	63. 1	64. 2
38	56. 1	57. 2	58. 2	59. 3	60. 4	61. 4	62. 5	63. 6
39	55. 6	56. 6	57. 7	58. 7	59. 8	60. 8	61. 9	62. 9
40	55. 0	56. 1	57. 1	58. 1	59. 2	60. 2	61. 3	62. 3
41	+54. 4	+55. 5	+56. 5	+57. 5	+58. 6	+59. 6	+60. 6	+61. 6
42	53. 9	54. 9	55. 9	56. 9	57. 9	59. 0	60. 0	61. 0
43	53. 3	54. 3	55. 3	56. 3	57. 3	58. 3	59. 3	60. 3
44	52. 7	53. 7	54. 6	55. 6	56. 6	57. 6	58. 6	59. 6
45	52. 0	53. 0	54. 0	55. 0	56. 0	56. 9	57. 9	58. 9

Obs. Alt. Lower Limb.	Lower Limb. Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
46	+51. 4	+52. 4	+53. 3	+54. 3	+55. 3	+56. 2	+57. 2	+58. 2
47	50. 7	51. 7	52. 6	53. 6	54. 6	55. 5	56. 5	57. 4
48	50. 1	51. 0	52. 0	52. 9	53. 9	54. 8	55. 7	56. 7
49	49. 4	50. 3	51. 3	52. 2	53. 1	54. 1	55. 0	55. 9
50	48. 7	49. 6	50. 5	51. 5	52. 4	53. 3	54. 2	55. 1
51	+48. 0	+48. 9	+49. 8	+50. 7	+51. 6	+52. 5	+53. 4	+54. 3
52	47. 3	48. 2	49. 1	50. 0	50. 9	51. 8	52. 7	53. 5
53	46. 6	47. 5	48. 3	49. 2	50. 1	51. 0	51. 8	52. 7
54	45. 8	46. 7	47. 6	48. 4	49. 3	50. 2	51. 0	51. 9
55	45. 1	46. 0	46. 8	47. 6	48. 5	49. 3	50. 2	51. 0
56	+44. 4	+45. 2	+46. 0	+46. 8	+47. 7	+48. 5	+49. 4	+50. 2
57	43. 6	44. 4	45. 2	46. 0	46. 9	47. 7	48. 5	49. 3
58	42. 8	43. 6	44. 4	45. 2	46. 0	46. 9	47. 7	48. 5
59	42. 1	42. 9	43. 6	44. 4	45. 2	46. 0	46. 8	47. 6
60	41. 3	42. 1	42. 8	43. 6	44. 4	45. 1	45. 9	46. 7
61	+40. 5	+41. 2	+42. 0	+42. 7	+43. 5	+44. 3	+45. 0	+45. 8
62	39. 6	40. 4	41. 1	41. 9	42. 6	43. 4	44. 1	44. 9
63	38. 8	39. 6	40. 3	41. 0	41. 8	42. 5	43. 2	43. 9
64	38. 0	38. 7	39. 4	40. 2	40. 9	41. 6	42. 3	43. 0
65	37. 2	37. 9	38. 6	39. 3	40. 0	40. 7	41. 4	42. 1
66	+36. 4	+37. 0	+37. 7	+38. 4	+39. 1	+39. 8	+40. 4	+41. 1
67	35. 5	36. 2	36. 8	37. 5	38. 2	38. 8	39. 5	40. 2
68	34. 7	35. 3	36. 0	36. 6	37. 3	37. 9	38. 6	39. 2
69	33. 8	34. 4	35. 1	35. 7	36. 3	37. 0	37. 6	38. 2
70	32. 9	33. 6	34. 2	34. 8	35. 4	36. 0	36. 7	37. 3
71	+32. 1	+32. 7	+33. 3	+33. 9	+34. 5	+35. 1	+35. 7	+36. 3
72	31. 2	31. 8	32. 3	32. 9	33. 5	34. 1	34. 7	35. 3
73	30. 3	30. 9	31. 4	32. 0	32. 6	33. 2	33. 7	34. 3
74	29. 4	30. 0	30. 5	31. 1	31. 6	32. 2	32. 7	33. 3
75	28. 5	29. 1	29. 6	30. 1	30. 7	31. 2	31. 8	32. 3
76	+27. 7	+28. 2	+28. 7	+29. 2	+29. 7	+30. 2	+30. 8	+31. 3
77	26. 8	27. 3	27. 7	28. 2	28. 8	29. 3	29. 8	30. 2
78	25. 8	26. 3	26. 8	27. 3	27. 8	28. 3	28. 7	29. 2
79	24. 9	25. 4	25. 9	26. 3	26. 8	27 3	27. 7	28. 2
80	24. 0	24. 5	24. 9	25. 4	25. 8	26. 3	26. 7	27. 2
81	+23. 1	+23. 6	+24. 0	+24. 4	+24. 8	+25. 3	+25. 7	+26. 2
82	22. 2	22. 6	23. 0	23. 4	23. 9	24. 3	24. 7	25. 1
83	21. 3	21. 7	22. 1	22. 5	22. 9	23. 3	23. 7	24. 1
84	20. 4	20. 8	21. 1	21. 5	21. 9	22. 3	22. 6	23. 0
85	19. 4	19. 8	20. 2	20. 5	20. 9	21. 3	21. 6	22. 0
86	+18. 5	+18. 9	+19. 2	+19. 6	+19. 9	+20. 3	+20. 6	+20. 9
87	17. 6	17. 9	18. 2	18. 6	18. 9	19. 2	19. 6	19. 9
88	16. 7	17. 0	17. 3	17. 6	17. 9	18. 2	18. 5	18. 8
89	15. 7	16. 0	16. 3	16. 6	16. 9	17. 2	17. 5	17. 8
90	+14. 7	+15. 0	+15. 3	+15. 6	+15. 8	+16. 1	+16. 4	+16. 7

Height of Eye Correction.

H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.
	′		′		′		′		′		′
0	0.0	10	−3.1	20	−4.4	30	−5.4	45	−6.6	80	−8.8
1	−1.0	11	−3.2	21	−4.5	31	−5.4	47	−6.7	85	−9.0
2	−1.4	12	−3.4	22	−4.6	32	−5.5	49	−6.9	90	−9.3
3	−1.7	13	−3.5	23	−4.7	33	−5.6	51	−7.0	95	−9.6
4	−2.0	14	−3.7	24	−4.8	34	−5.7	53	−7.1	100	−9.8
5	−2.2	15	−3.8	25	−4.9	35	−5.8	55	−7.3	105	−10.0
6	−2.4	16	−3.9	26	−5.0	37	−6.0	60	−7.6	110	−10.3
7	−2.6	17	−4.0	27	−5.1	39	−6.1	65	−7.9	115	−10.5
8	−2.8	18	−4.1	28	−5.2	41	−6.3	70	−8.2	120	−10.7
9	−2.9	19	−4.3	29	−5.3	43	−6.4	75	−8.5	125	−11.0

TABLE C

FOR REFRACTION, PARALLAX, AND SEMIDIAMETER

Obs. Alt. Upper Limb.	Upper Limb — Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
5. 5	+29. 4	+30. 2	+30. 9	+31. 6	+32. 3	+33. 0	+33. 7	+34. 4
6. 0	30. 1	30. 8	31. 5	32. 3	33. 0	33. 7	34. 4	35. 1
6. 5	30. 7	31. 4	32. 1	32. 8	33. 5	34. 3	35. 0	35. 7
7. 0	31. 2	31. 9	32. 6	33. 3	34. 0	34. 8	35. 5	36. 2
7. 5	31. 6	32. 3	33. 0	33. 7	34. 5	35. 2	35. 9	36. 6
8. 0	+32. 0	+32. 7	+33. 4	+34. 1	+34. 8	+35. 5	+36. 3	+37. 0
8. 5	32. 3	33. 0	33. 7	34. 4	35. 1	35. 9	36. 6	37. 3
9. 0	32. 6	33. 3	34. 0	34. 7	35. 4	36. 1	36. 8	37. 5
9. 5	32. 8	33. 5	34. 2	34. 9	35. 6	36. 3	37 1	37. 8
10. 0	33. 0	33. 7	34. 4	35. 1	35. 8	36. 5	37. 3	38. 0
11	+33. 3	+34. 0	+34. 7	+35. 4	+36. 2	+36. 9	+37. 6	+38. 3
12	33. 6	34. 3	35. 0	35. 7	36. 4	37. 1	37. 8	38. 5
13	33. 7	34. 4	35. 1	35. 8	36. 5	37. 2	37. 9	38. 6
14	33. 8	34. 5	35. 2	35. 9	36. 6	37. 3	38. 0	38. 7
15	33. 8	34. 5	35. 2	35. 9	36. 6	37. 3	38. 0	38. 7
16	+33. 8	+34. 5	+35. 2	+35. 9	+36. 6	+37. 3	+38. 0	+38. 6
17	33. 8	34. 5	35. 1	35. 8	36. 5	37. 2	37. 9	38. 6
18	33. 7	34. 3	35. 0	35. 7	36. 4	37. 1	37. 7	38. 4
19	33. 5	34. 2	34. 9	35. 6	36. 2	36. 9	37. 6	38. 2
20	33. 4	34. 0	34. 7	35. 4	36. 0	36. 7	37. 4	38. 1
21	+33. 2	+33. 9	+34. 5	+35. 2	+35. 8	+36. 5	+37. 2	+37. 8
22	33. 0	33. 6	34. 3	34. 9	35. 6	36. 3	36. 9	37. 6
23	32. 7	33. 4	34. 0	34. 7	35. 3	36. 0	36. 6	37. 3
24	32. 5	33. 1	33. 7	34. 4	35. 0	35. 7	36. 3	37. 0
25	32. 2	32. 8	33. 4	34. 1	34. 7	35. 4	36. 0	36. 6
26	+31. 9	+32. 5	+33. 1	+33. 7	+34. 4	+35. 0	+35. 6	+36. 2
27	31. 5	32. 1	32. 8	33. 4	34. 0	34. 6	35. 2	35. 9
28	31. 2	31. 8	32. 4	33. 0	33. 6	34. 2	34. 9	35. 5
29	30. 8	31. 4	32. 0	32. 6	33. 2	33. 8	34. 4	35. 0
30	30. 4	31. 0	31. 6	32. 2	32. 8	33. 4	34. 0	34. 6
31	+30. 0	+30. 6	+31. 2	+31. 8	+32. 3	+32. 9	+33. 5	+34. 1
32	29. 6	30. 1	30. 7	31. 3	31. 9	32. 5	33. 0	33. 6
33	29. 1	29. 7	30. 3	30. 8	31. 4	32. 0	32. 5	33. 1
34	28. 7	29. 2	29. 8	30. 3	30. 9	31. 5	32. 0	32. 6
35	28. 2	28. 7	29. 3	29. 8	30. 4	30. 9	31. 5	32. 0
36	+27. 7	+28. 2	+28. 8	+29. 3	+29. 8	+30. 4	+30. 9	+31. 5
37	27. 2	27. 7	28. 2	28. 8	29. 3	29. 8	30. 3	30. 9
38	26. 7	27. 2	27. 7	28. 2	28. 7	29. 2	29. 7	30. 3
39	26. 1	26. 6	27. 1	27. 6	28. 1	28. 6	29. 1	29. 6
40	25. 6	26. 1	26. 6	27. 1	27. 6	28. 0	28. 5	29. 0
41	+25. 0	+25. 5	+26. 0	+26. 4	+26. 9	+27. 4	+27. 9	+28. 4
42	24. 4	24. 9	25. 4	25. 8	26. 3	26. 8	27. 2	27. 7
43	23. 8	24. 3	24. 7	25. 2	25. 6	26. 1	26. 6	27. 0
44	23. 2	23. 6	24. 1	24. 6	25. 0	25. 4	25. 9	26. 3
45	22. 6	23. 0	23. 4	23. 9	24. 3	24. 7	25. 2	25. 6

Obs. Alt. Upper Limb.	Upper Limb. — Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
46	+21. 9	+22. 4	+22. 8	+23. 2	+23. 6	+24. 0	+24. 5	+24. 9
47	21. 3	21. 7	22. 1	22. 5	22. 9	23. 3	23. 8	24. 2
48	20. 6	21. 0	21. 4	21. 8	22. 2	22. 6	23. 0	23 4
49	19. 9	20. 3	20. 7	21. 1	21. 5	21. 9	22. 3	22. 6
50	19. 2	19. 6	20. 0	20. 4	20. 7	21. 1	21. 5	21. 9
51	+18. 5	+18. 9	+19. 3	+19. 6	+20. 0	+20. 3	+20. 7	+21. 1
52	17. 8	18. 2	18. 5	18. 9	19. 2	19. 6	19. 9	20. 3
53	17. 1	17. 5	17. 8	18. 1	18. 4	18. 8	19. 1	19. 4
54	16. 4	16. 7	17. 0	17. 3	17. 7	18. 0	18. 3	18. 6
55	15. 7	16. 0	16. 3	16. 6	16. 9	17. 2	17. 5	17. 8
56	+14. 9	+15. 2	+15. 5	+15. 8	+16. 1	+16. 3	+16. 6	+16. 9
57	14. 2	14. 4	14. 7	15. 0	15. 2	15. 5	15. 8	16. 1
58	13. 4	13. 6	13. 9	14. 2	14. 4	14. 7	14. 9	15. 2
59	12. 6	12. 8	13. 1	13. 3	13. 6	13. 8	14. 1	14. 3
60	11. 8	12. 0	12. 3	12. 5	12. 7	13. 0	13. 2	13. 4
61	+11. 0	+11. 2	+11. 4	+11. 6	+11. 9	+12. 1	+12. 3	+12. 5
62	10. 2	10. 4	10. 6	10. 8	11. 0	11. 2	11. 4	11. 6
63	9. 4	9. 6	9. 8	9. 9	10. 1	10. 3	10. 5	10. 7
64	8. 6	8. 7	8. 9	9. 1	9. 2	9. 4	9. 6	9. 7
65	7. 7	7. 9	8. 0	8. 2	8. 3	8. 5	8. 7	8. 8
66	+ 6. 9	+ 7. 0	+ 7. 2	+ 7. 3	+ 7. 5	+ 7. 6	+ 7. 7	+ 7. 9
67	6. 1	6. 2	6. 3	6. 4	6. 5	6. 7	6. 8	6. 9
68	5. 2	5. 3	5. 4	5. 5	5. 6	5. 7	5. 8	5. 9
69	4. 3	4. 4	4. 5	4. 6	4. 7	4. 8	4. 8	4. 9
70	3. 5	3. 5	3. 6	3. 7	3. 8	3. 8	3. 9	4. 0
71	+ 2. 6	+ 2. 7	+2. 7	+ 2. 8	+ 2. 8	+ 2. 9	+ 2. 9	+ 3. 0
72	1. 7	1. 8	1. 8	1. 9	1. 9	1. 9	2. 0	2. 0
73	+ 0. 9	+ 0 9	+ 0. 9	+ 0. 9	+ 0. 9	+ 1. 0	+ 1. 0	+ 1. 0
74	0. 0	0. 0	0. 0	0. 0	0. 0	0. 0	0. 0	0. 0
75	- 0. 9	- 0. 9	- 0. 9	- 1. 0	- 1. 0	- 1. 0	- 1. 0	- 1. 0
76	- 1. 8	- 1. 9	- 1. 9	- 1. 9	- 1. 9	- 2. 0	- 2. 0	- 2. 0
77	2. 7	2. 8	2. 8	2. 9	2. 9	2. 9	3. 0	3. 0
78	3. 6	3. 7	3. 8	3. 8	3. 9	3. 9	4. 0	4. 1
79	4. 5	4. 6	4. 7	4. 8	4. 8	4. 9	5. 0	5. 1
80	5. 4	5. 5	5. 6	5. 7	5. 8	5. 9	6. 0	6. 1
81	- 6. 3	- 6. 5	- 6. 6	- 6. 7	- 6. 8	- 6. 9	- 7. 0	- 7. 2
82	7. 3	7. 4	7. 5	7. 7	7. 8	7. 9	8. 1	8. 2
83	8. 2	8. 3	8. 5	8. 6	8. 8	8. 9	9. 1	9. 2
84	9. 1	9. 3	9. 4	9. 6	9. 8	9. 9	10. 1	10. 3
85	10. 0	10. 2	10. 4	10. 6	10. 8	10. 9	11. 1	11. 3
86	-10. 9	-11. 2	-11. 4	-11. 5	-11. 7	-12. 0	-12. 2	-12. 3
87	11. 9	12. 1	12. 3	12. 5	12. 7	13. 0	13. 2	13. 4
88	12. 8	13. 0	13. 3	13. 5	13. 7	14. 0	14. 2	14 4
89	13. 7	14. 0	14. 3	14. 5	14. 7	15. 0	15. 3	15. 5
90	-14. 7	-15. 0	-15. 3	-15. 6	-15. 8	-16. 1	-16. 4	-16. 7

Height of Eye Correction.

H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr	H E. feet.	Corr.	H. E. feet.	Corr.
	′		′		′		′		′		′
0	0.0	10	−3.1	20	−4.4	30	−5.4	45	−6.6	80	−8.8
1	−1.0	11	−3.2	21	−4.5	31	−5.4	47	−6.7	85	−9.0
2	−1.4	12	−3.4	22	−4.6	32	−5.5	49	−6.9	90	−9.3
3	−1.7	13	−3.5	23	−4.7	33	−5.6	51	−7.0	95	−9.6
4	−2.0	14	−3.7	24	−4.8	34	−5.7	53	−7.1	100	−9.8
5	−2.2	15	−3.8	25	−4.9	35	−5.8	55	−7.3	105	−10.0
6	−2.4	16	−3.9	26	−5.0	37	−6.0	60	−7.6	110	−10.3
7	−2.6	17	−4.0	27	−5.1	39	−6.1	65	−7.9	115	−10.5
8	−2.8	18	−4.1	28	−5.2	41	−6.3	70	−8.2	120	−10.7
9	−2.9	19	−4.3	29	−5.3	43	−6.4	75	−8.5	125	−11.0

Table III
Table I
Table II
Explanation of the Construction and Use of Tables

TABLE III.

MEAN SOLAR INTO SIDEREAL TIME.

TO BE ADDED TO A MEAN TIME INTERVAL.

Mean Solar.	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	0 0.0	0 9.9	0 19.7	0 29.6	0 39.4	0 49.3	0 59.1	1 9.0	1 18.9	1 28.7	1 38.6	1 48.4
1	0 0.2	0 10.0	0 19.9	0 29.7	0 39.6	0 49.4	0 59.3	1 9.2	1 19.0	1 28.9	1 38.7	1 48.6
2	0 0.3	0 10.2	0 20.0	0 29.9	0 39.8	0 49.6	0 59.5	1 9.3	1 19.2	1 29.0	1 38.9	1 48.8
3	0 0.5	0 10.3	0 20.2	0 30.1	0 39.9	0 49.8	0 59.6	1 9.5	1 19.3	1 29.2	1 39.1	1 48.9
4	0 0.7	0 10.5	0 20.4	0 30.2	0 40.1	0 49.9	0 59.8	1 9.7	1 19.5	1 29.4	1 39.2	1 49.1
5	0 0.8	0 10.7	0 20.5	0 30.4	0 40.2	0 50.1	1 0.0	1 9.8	1 19.7	1 29.5	1 39.4	1 49.2
6	0 1.0	0 10.8	0 20.7	0 30.6	0 40.4	0 50.3	1 0.1	1 10.0	1 19.8	1 29.7	1 39.6	1 49.4
7	0 1.2	0 11.0	0 20.9	0 30.7	0 40.6	0 50.4	1 0.3	1 10.1	1 20.0	1 29.9	1 39.7	1 49.6
8	0 1.3	0 11.2	0 21.0	0 30.9	0 40.7	0 50.6	1 0.5	1 10.3	1 20.2	1 30.0	1 39.9	1 49.7
9	0 1.5	0 11.3	0 21.2	0 31.0	0 40.9	0 50.8	1 0.6	1 10.5	1 20.3	1 30.2	1 40.0	1 49.9
10	0 1.6	0 11.5	0 21.4	0 31.2	0 41.1	0 50.9	1 0.8	1 10.6	1 20.5	1 30.4	1 40.2	1 50.1
11	0 1.8	0 11.7	0 21.5	0 31.4	0 41.2	0 51.1	1 0.9	1 10.8	1 20.7	1 30.5	1 40.4	1 50.2
12	0 2.0	0 11.8	0 21.7	0 31.5	0 41.4	0 51.3	1 1.1	1 11.0	1 20.8	1 30.7	1 40.5	1 50.4
13	0 2.1	0 12.0	0 21.8	0 31.7	0 41.6	0 51.4	1 1.3	1 11.1	1 21.0	1 30.8	1 40.7	1 50.6
14	0 2.3	0 12.2	0 22.0	0 31.9	0 41.7	0 51.6	1 1.4	1 11.3	1 21.2	1 31.0	1 40.9	1 50.7
15	0 2.5	0 12.3	0 22.2	0 32.0	0 41.9	0 51.7	1 1.6	1 11.5	1 21.3	1 31.2	1 41.0	1 50.9
16	0 2.6	0 12.5	0 22.3	0 32.2	0 42.1	0 51.9	1 1.8	1 11.6	1 21.5	1 31.3	1 41.2	1 51.0
17	0 2.8	0 12.6	0 22.5	0 32.4	0 42.2	0 52.1	1 1.9	1 11.8	1 21.6	1 31.5	1 41.4	1 51.2
18	0 3.0	0 12.8	0 22.7	0 32.5	0 42.4	0 52.2	1 2.1	1 12.0	1 21.8	1 31.7	1 41.5	1 51.4
19	0 3.1	0 13.0	0 22.8	0 32.7	0 42.5	0 52.4	1 2.3	1 12.1	1 22.0	1 31.8	1 41.7	1 51.5
20	0 3.3	0 13.1	0 23.0	0 32.9	0 42.7	0 52.6	1 2.4	1 12.3	1 22.1	1 32.0	1 41.8	1 51.7
21	0 3.4	0 13.3	0 23.2	0 33.0	0 42.9	0 52.7	1 2.6	1 12.4	1 22.3	1 32.2	1 42.0	1 51.9
22	0 3.6	0 13.5	0 23.3	0 33.2	0 43.0	0 52.9	1 2.8	1 12.6	1 22.5	1 32.3	1 42.2	1 52.0
23	0 3.8	0 13.6	0 23.5	0 33.3	0 43.2	0 53.1	1 2.9	1 12.8	1 22.6	1 32.5	1 42.3	1 52.2
24	0 3.9	0 13.8	0 23.7	0 33.5	0 43.4	0 53.2	1 3.1	1 12.9	1 22.8	1 32.7	1 42.5	1 52.4
25	0 4.1	0 14.0	0 23.8	0 33.7	0 43.5	0 53.4	1 3.2	1 13.1	1 23.0	1 32.8	1 42.7	1 52.5
26	0 4.3	0 14.1	0 24.0	0 33.8	0 43.7	0 53.6	1 3.4	1 13.3	1 23.1	1 33.0	1 42.8	1 52.7
27	0 4.4	0 14.3	0 24.1	0 34.0	0 43.9	0 53.7	1 3.6	1 13.4	1 23.3	1 33.1	1 43.0	1 52.9
28	0 4.6	0 14.5	0 24.3	0 34.2	0 44.0	0 53.9	1 3.7	1 13.6	1 23.5	1 33.3	1 43.2	1 53.0
29	0 4.8	0 14.6	0 24.5	0 34.3	0 44.2	0 54.0	1 3.9	1 13.8	1 23.6	1 33.5	1 43.3	1 53.2
30	0 4.9	0 14.8	0 24.6	0 34.5	0 44.4	0 54.2	1 4.1	1 13.9	1 23.8	1 33.6	1 43.5	1 53.3
31	0 5.1	0 14.9	0 24.8	0 34.7	0 44.5	0 54.4	1 4.2	1 14.1	1 23.9	1 33.8	1 43.7	1 53.5
32	0 5.3	0 15.1	0 25.0	0 34.8	0 44.7	0 54.5	1 4.4	1 14.3	1 24.1	1 34.0	1 43.8	1 53.7
33	0 5.4	0 15.3	0 25.1	0 35.0	0 44.8	0 54.7	1 4.6	1 14.4	1 24.3	1 34.1	1 44.0	1 53.8
34	0 5.6	0 15.4	0 25.3	0 35.2	0 45.0	0 54.9	1 4.7	1 14.6	1 24.4	1 34.3	1 44.2	1 54.0
35	0 5.8	0 15.6	0 25.5	0 35.3	0 45.2	0 55.0	1 4.9	1 14.7	1 24.6	1 34.5	1 44.3	1 54.2
36	0 5.9	0 15.8	0 25.6	0 35.5	0 45.3	0 55.2	1 5.1	1 14.9	1 24.8	1 34.6	1 44.5	1 54.3
37	0 6.1	0 15.9	0 25.8	0 35.6	0 45.5	0 55.4	1 5.2	1 15.1	1 24.9	1 34.8	1 44.6	1 54.5
38	0 6.2	0 16.1	0 26.0	0 35.8	0 45.7	0 55.5	1 5.4	1 15.2	1 25.1	1 35.0	1 44.8	1 54.7
39	0 6.4	0 16.3	0 26.1	0 36.0	0 45.8	0 55.7	1 5.5	1 15.4	1 25.3	1 35.1	1 45.0	1 54.8
40	0 6.6	0 16.4	0 26.3	0 36.1	0 46.0	0 55.9	1 5.7	1 15.6	1 25.4	1 35.3	1 45.1	1 55.0
41	0 6.7	0 16.6	0 26.4	0 36.3	0 46.2	0 56.0	1 5.9	1 15.7	1 25.6	1 35.4	1 45.3	1 55.2
42	0 6.9	0 16.8	0 26.6	0 36.5	0 46.3	0 56.2	1 6.0	1 15.9	1 25.8	1 35.6	1 45.5	1 55.3
43	0 7.1	0 16.9	0 26.8	0 36.6	0 46.5	0 56.3	1 6.2	1 16.1	1 25.9	1 35.8	1 45.6	1 55.5
44	0 7.2	0 17.1	0 26.9	0 36.8	0 46.7	0 56.5	1 6.4	1 16.2	1 26.1	1 35.9	1 45.8	1 55.6
45	0 7.4	0 17.2	0 27.1	0 37.0	0 46.8	0 56.7	1 6.5	1 16.4	1 26.2	1 36.1	1 46.0	1 55.8
46	0 7.6	0 17.4	0 27.3	0 37.1	0 47.0	0 56.8	1 6.7	1 16.6	1 26.4	1 36.3	1 46.1	1 56.0
47	0 7.7	0 17.6	0 27.4	0 37.3	0 47.1	0 57.0	1 6.9	1 16.7	1 26.6	1 36.4	1 46.3	1 56.1
48	0 7.9	0 17.7	0 27.6	0 37.5	0 47.3	0 57.2	1 7.0	1 16.9	1 26.7	1 36.6	1 46.4	1 56.3
49	0 8.0	0 17.9	0 27.8	0 37.6	0 47.5	0 57.3	1 7.2	1 17.0	1 26.9	1 36.8	1 46.6	1 56.5
50	0 8.2	0 18.1	0 27.9	0 37.8	0 47.6	0 57.5	1 7.4	1 17.2	1 27.1	1 36.9	1 46.8	1 56.6
51	0 8.4	0 18.2	0 28.1	0 37.9	0 47.8	0 57.7	1 7.5	1 17.4	1 27.2	1 37.1	1 46.9	1 56.8
52	0 8.5	0 18.4	0 28.3	0 38.1	0 48.0	0 57.8	1 7.7	1 17.5	1 27.4	1 37.3	1 47.1	1 57.0
53	0 8.7	0 18.6	0 28.4	0 38.3	0 48.1	0 58.0	1 7.8	1 17.7	1 27.6	1 37.4	1 47.3	1 57.1
54	0 8.9	0 18.7	0 28.6	0 38.4	0 48.3	0 58.2	1 8.0	1 17.9	1 27.7	1 37.6	1 47.4	1 57.3
55	0 9.0	0 18.9	0 28.7	0 38.6	0 48.5	0 58.3	1 8.2	1 18.0	1 27.9	1 37.7	1 47.6	1 57.5
56	0 9.2	0 19.1	0 28.9	0 38.8	0 48.6	0 58.5	1 8.3	1 18.2	1 28.1	1 37.9	1 47.8	1 57.6
57	0 9.4	0 19.2	0 29.1	0 38.9	0 48.8	0 58.6	1 8.5	1 18.4	1 28.2	1 38.1	1 47.9	1 57.8
58	0 9.5	0 19.4	0 29.2	0 39.1	0 49.0	0 58.8	1 8.7	1 18.5	1 28.4	1 38.2	1 48.1	1 57.9
59	0 9.7	0 19.5	0 29.4	0 39.3	0 49.1	0 59.0	1 8.8	1 18.7	1 28.5	1 38.4	1 48.3	1 58.1

TABLE III.

MEAN SOLAR INTO SIDEREAL TIME.

TO BE ADDED TO A MEAN TIME INTERVAL.

Mean Solar.	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	1 58.3	2 8.1	2 18.0	2 27.8	2 37.7	2 47.6	2 57.4	3 7.3	3 17.1	3 27.0	3 36.8	3 46.7
1	1 58.4	2 8.3	2 18.2	2 28.0	2 37.9	2 47.7	2 57.6	3 7.4	3 17.3	3 27.2	3 37.0	3 46.9
2	1 58.6	2 8.5	2 18.3	2 28.2	2 38.0	2 47.9	2 57.7	3 7.6	3 17.5	3 27.3	3 37.2	3 47.0
3	1 58.8	2 8.6	2 18.5	2 28.3	2 38.2	2 48.1	2 57.9	3 7.8	3 17.6	3 27.5	3 37.3	3 47.2
4	1 58.9	2 8.8	2 18.6	2 28.5	2 38.4	2 48.2	2 58.1	3 7.9	3 17.8	3 27.6	3 37.5	3 47.4
5	1 59.1	2 9.0	2 18.8	2 28.7	2 38.5	2 48.4	2 58.2	3 8.1	3 18.0	3 27.8	3 37.7	3 47.5
6	1 59.3	2 9.1	2 19.0	2 28.8	2 38.7	2 48.5	2 58.4	3 8.3	3 18.1	3 28.0	3 37.8	3 47.7
7	1 59.4	2 9.3	2 19.1	2 29.0	2 38.9	2 48.7	2 58.6	3 8.4	3 18.3	3 28.1	3 38.0	3 47.8
8	1 59.6	2 9.4	2 19.3	2 29.2	2 39.0	2 48.9	2 58.7	3 8.6	3 18.4	3 28.3	3 38.2	3 48.0
9	1 59.8	2 9.6	2 19.5	2 29.3	2 39.2	2 49.0	2 58.9	3 8.8	3 18.6	3 28.5	3 38.3	3 48.2
10	1 59.9	2 9.8	2 19.6	2 29.5	2 39.3	2 49.2	2 59.1	3 8.9	3 18.8	3 28.6	3 38.5	3 48.3
11	2 0.1	2 9.9	2 19.8	2 29.7	2 39.5	2 49.4	2 59.2	3 9.1	3 18.9	3 28.8	3 38.6	3 48.5
12	2 0.2	2 10.1	2 20.0	2 29.8	2 39.7	2 49.5	2 59.4	3 9.2	3 19.1	3 29.0	3 38.8	3 48.7
13	2 0.4	2 10.3	2 20.1	2 30.0	2 39.8	2 49.7	2 59.6	3 9.4	3 19.3	3 29.1	3 39.0	3 48.8
14	2 0.6	2 10.4	2 20.3	2 30.1	2 40.0	2 49.9	2 59.7	3 9.6	3 19.4	3 29.3	3 39.1	3 49.0
15	2 0.7	2 10.6	2 20.5	2 30.3	2 40.2	2 50.0	2 59.9	3 9.7	3 19.6	3 29.4	3 39.3	3 49.2
16	2 0.9	2 10.8	2 20.6	2 30.5	2 40.3	2 50.2	3 0.0	3 9.9	3 19.8	3 29.6	3 39.5	3 49.3
17	2 1.1	2 10.9	2 20.8	2 30.6	2 40.5	2 50.4	3 0.2	3 10.1	3 19.9	3 29.8	3 39.6	3 49.5
18	2 1.2	2 11.1	2 20.9	2 30.8	2 40.7	2 50.5	3 0.4	3 10.2	3 20.1	3 29.9	3 39.8	3 49.7
19	2 1.4	2 11.3	2 21.1	2 31.0	2 40.8	2 50.7	3 0.5	3 10.4	3 20.3	3 30.1	3 40.0	3 49.8
20	2 1.6	2 11.4	2 21.3	2 31.1	2 41.0	2 50.8	3 0.7	3 10.6	3 20.4	3 30.3	3 40.1	3 50.0
21	2 1.7	2 11.6	2 21.4	2 31.3	2 41.2	2 51.0	3 0.9	3 10.7	3 20.6	3 30.4	3 40.3	3 50.1
22	2 1.9	2 11.7	2 21.6	2 31.5	2 41.3	2 51.2	3 1.0	3 10.9	3 20.7	3 30.6	3 40.5	3 50.3
23	2 2.1	2 11.9	2 21.8	2 31.6	2 41.5	2 51.3	3 1.2	3 11.1	3 20.9	3 30.8	3 40.6	3 50.5
24	2 2.2	2 12.1	2 21.9	2 31.8	2 41.6	2 51.5	3 1.4	3 11.2	3 21.1	3 30.9	3 40.8	3 50.6
25	2 2.4	2 12.2	2 22.1	2 32.0	2 41.8	2 51.7	3 1.5	3 11.4	3 21.2	3 31.1	3 40.9	3 50.8
26	2 2.5	2 12.4	2 22.3	2 32.1	2 42.0	2 51.8	3 1.7	3 11.5	3 21.4	3 31.3	3 41.1	3 51.0
27	2 2.7	2 12.6	2 22.4	2 32.3	2 42.1	2 52.0	3 1.9	3 11.7	3 21.6	3 31.4	3 41.3	3 51.1
28	2 2.9	2 12.7	2 22.6	2 32.4	2 42.3	2 52.2	3 2.0	3 11.9	3 21.7	3 31.6	3 41.4	3 51.3
29	2 3.0	2 12.9	2 22.8	2 32.6	2 42.5	2 52.3	3 2.2	3 12.0	3 21.9	3 31.8	3 41.6	3 51.5
30	2 3.2	2 13.1	2 22.9	2 32.8	2 42.6	2 52.5	3 2.3	3 12.2	3 22.1	3 31.9	3 41.8	3 51.6
31	2 3.4	2 13.2	2 23.1	2 32.9	2 42.8	2 52.7	3 2.5	3 12.4	3 22.2	3 32.1	3 41.9	3 51.8
32	2 3.5	2 13.4	2 23.2	2 33.1	2 43.0	2 52.8	3 2.7	3 12.5	3 22.4	3 32.2	3 42.1	3 52.0
33	2 3.7	2 13.6	2 23.4	2 33.3	2 43.1	2 53.0	3 2.8	3 12.7	3 22.6	3 32.4	3 42.3	3 52.1
34	2 3.9	2 13.7	2 23.6	2 33.4	2 43.3	2 53.1	3 3.0	3 12.9	3 22.7	3 32.6	3 42.4	3 52.3
35	2 4.0	2 13.9	2 23.7	2 33.6	2 43.5	2 53.3	3 3.2	3 13.0	3 22.9	3 32.7	3 42.6	3 52.4
36	2 4.2	2 14.0	2 23.9	2 33.8	2 43.6	2 53.5	3 3.3	3 13.2	3 23.0	3 32.9	3 42.8	3 52.6
37	2 4.4	2 14.2	2 24.1	2 33.9	2 43.8	2 53.6	3 3.5	3 13.4	3 23.2	3 33.1	3 42.9	3 52.8
38	2 4.5	2 14.4	2 24.2	2 34.1	2 43.9	2 53.8	3 3.7	3 13.5	3 23.4	3 33.2	3 43.1	3 52.9
39	2 4.7	2 14.5	2 24.4	2 34.3	2 44.1	2 54.0	3 3.8	3 13.7	3 23.5	3 33.4	3 43.2	3 53.1
40	2 4.8	2 14.7	2 24.6	2 34.4	2 44.3	2 54.1	3 4.0	3 13.8	3 23.7	3 33.6	3 43.4	3 53.3
41	2 5.0	2 14.9	2 24.7	2 34.6	2 44.4	2 54.3	3 4.2	3 14.0	3 23.9	3 33.7	3 43.6	3 53.4
42	2 5.2	2 15.0	2 24.9	2 34.7	2 44.6	2 54.5	3 4.3	3 14.2	3 24.0	3 33.9	3 43.7	3 53.6
43	2 5.3	2 15.2	2 25.1	2 34.9	2 44.8	2 54.6	3 4.5	3 14.3	3 24.2	3 34.0	3 43.9	3 53.8
44	2 5.5	2 15.4	2 25.2	2 35.1	2 44.9	2 54.8	3 4.6	3 14.5	3 24.4	3 34.2	3 44.1	3 53.9
45	2 5.7	2 15.5	2 25.4	2 35.2	2 45.1	2 55.0	3 4.8	3 14.7	3 24.5	3 34.4	3 44.2	3 54.1
46	2 5.8	2 15.7	2 25.5	2 35.4	2 45.3	2 55.1	3 5.0	3 14.8	3 24.7	3 34.5	3 44.4	3 54.3
47	2 6.0	2 15.9	2 25.7	2 35.6	2 45.4	2 55.3	3 5.1	3 15.0	3 24.8	3 34.7	3 44.6	3 54.4
48	2 6.2	2 16.0	2 25.9	2 35.7	2 45.6	2 55.4	3 5.3	3 15.2	3 25.0	3 34.9	3 44.7	3 54.6
49	2 6.3	2 16.2	2 26.0	2 35.9	2 45.8	2 55.6	3 5.5	3 15.3	3 25.2	3 35.0	3 44.9	3 54.7
50	2 6.5	2 16.3	2 26.2	2 36.1	2 45.9	2 55.8	3 5.6	3 15.5	3 25.3	3 35.2	3 45.1	3 54.9
51	2 6.7	2 16.5	2 26.4	2 36.2	2 46.1	2 55.9	3 5.8	3 15.7	3 25.5	3 35.4	3 45.2	3 55.1
52	2 6.8	2 16.7	2 26.5	2 36.4	2 46.2	2 56.1	3 6.0	3 15.8	3 25.7	3 35.5	3 45.4	3 55.2
53	2 7.0	2 16.8	2 26.7	2 36.6	2 46.4	2 56.3	3 6.1	3 16.0	3 25.8	3 35.7	3 45.5	3 55.4
54	2 7.1	2 17.0	2 26.9	2 36.7	2 46.6	2 56.4	3 6.3	3 16.1	3 26.0	3 35.9	3 45.7	3 55.6
55	2 7.3	2 17.2	2 27.0	2 36.9	2 46.7	2 56.6	3 6.5	3 16.3	3 26.2	3 36.0	3 45.9	3 55.7
56	2 7.5	2 17.3	2 27.2	2 37.0	2 46.9	2 56.8	3 6.6	3 16.5	3 26.3	3 36.2	3 46.0	3 55.9
57	2 7.6	2 17.5	2 27.4	2 37.2	2 47.1	2 56.9	3 6.8	3 16.6	3 26.5	3 36.4	3 46.2	3 56.1
58	2 7.8	2 17.7	2 27.5	2 37.4	2 47.2	2 57.1	3 6.9	3 16.8	3 26.7	3 36.5	3 46.4	3 56.2
59	2 8.0	2 17.8	2 27.7	2 37.5	2 47.4	2 57.3	3 7.1	3 17.0	3 26.8	3 36.7	3 46.5	3 56.4

Table III

Table I

Table II

Explanation of the Construction and Use of Tables

t° / L°	1° b	1° A	1° C	1° Z′	2° b	2° A	2° C	2° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	7	1758	90. 0	90 0.0	26	1457	90. 0	0
1	89 0.0	7	1758	90. 0	89 0.0	26	1457	90. 0	1
2	88 0.0	7	1758	90. 0	87 59.9	26	1458	89. 9	2
3	87 0.0	7	1759	90. 0	86 59.9	26	1458	89. 9	3
4	86 0.0	7	1759	89. 9	85 59.9	26	1458	89. 9	4
5	85 0.0	6	1760	89. 9	84 59.8	26	1459	89. 8	5
6	83 59.9	6	1760	89. 9	83 59.8	26	1460	89. 8	6
7	82 59.9	6	1761	89. 9	82 59.7	26	1460	89. 8	7
8	81 59.9	6	1763	89. 9	81 59.7	26	1462	89. 7	8
9	80 59.9	6	1763	89. 9	80 59.7	26	1463	89. 7	9
10	79 59.9	6	1765	89. 8	79 59.6	26	1464	89. 7	10
11	78 59.9	6	1766	89. 8	78 59.6	26	1465	89. 6	11
12	77 59.9	6	1768	89. 8	77 59.6	25	1467	89. 6	12
13	76 59.9	6	1769	89. 8	76 59.5	25	1469	89. 6	13
14	75 59.9	6	1771	89. 8	75 59.5	25	1470	89. 5	14
15	74 59.9	6	1773	89. 7	74 59.5	25	1472	89. 5	15
16	73 59.9	6	1775	89. 7	73 59.4	24	1475	89. 4	16
17	72 59.9	6	1777	89. 7	72 59.4	24	1476	89. 4	17
18	71 59.9	6	1780	89. 7	71 59.4	24	1479	89. 4	18
19	70 59.8	6	1783	89. 7	70 59.4	24	1481	89. 3	19
20	69 59.8	6	1785	89. 7	69 59.3	23	1484	89. 3	20
21	68 59.8	6	1788	89. 6	68 59.3	23	1487	89. 3	21
22	67 59.8	6	1791	89. 6	67 59.3	23	1490	89. 3	22
23	66 59.8	6	1794	89. 6	66 59.2	22	1493	89. 2	23
24	65 59.8	6	1798	89. 6	65 59.2	22	1497	89. 2	24
25	64 59.8	5	1801	89. 6	64 59.2	21	1500	89. 2	25
26	63 59.8	5	1805	89. 6	63 59.2	21	1503	89. 1	26
27	62 59.8	5	1808	89. 5	62 59.2	21	1507	89. 1	27
28	61 59.8	5	1812	89. 5	61 59.1	20	1511	89. 1	28
29	60 59.8	5	1816	89. 5	60 59.1	20	1516	89. 0	29
30	59 59.8	5	1820	89. 5	59 59.1	20	1520	89. 0	30
31	58 59.8	5	1825	89. 5	58 59.1	20	1524	89. 0	31
32	57 59.8	5	1830	89. 5	57 59.1	19	1529	88. 9	32
33	56 59.8	5	1835	89. 5	56 59.0	19	1534	88. 9	33
34	55 59.8	4	1840	89. 4	55 59.0	18	1539	88. 9	34
35	54 59.8	4	1845	89. 4	54 59.0	18	1544	88. 9	35
36	53 59.8	4	1851	89. 4	53 59.0	17	1549	88. 8	36
37	52 59.8	4	1856	89. 4	52 59.0	17	1555	88. 8	37
38	51 59.8	4	1861	89. 4	51 59.0	16	1560	88. 8	38
39	50 59.8	4	1868	89. 4	50 59.0	16	1566	88. 7	39
40	49 59.7	4	1874	89. 4	49 59.0	16	1573	88. 7	40
41	48 59.7	4	1880	89. 3	48 59.0	15	1579	88. 7	41
42	47 59.7	4	1887	89. 3	47 59.0	15	1586	88. 7	42
43	46 59.7	4	1894	89. 3	46 59.0	14	1593	88. 6	43
44	45 59.7	3	1901	89. 3	45 59.0	14	1600	88. 6	44
45	44 59.7	3	1909	89. 3	44 59.0	13	1608	88. 6	45
46	43 59.7	3	1916	89. 3	43 59.0	13	1616	88. 6	46
47	42 59.7	3	1925	89. 3	42 59.0	12	1624	88. 5	47
48	41 59.7	3	1933	89. 3	41 59.0	12	1632	88. 5	48
49	40 59.7	3	1941	89. 2	40 59.0	11	1640	88. 5	49
50	39 59.8	3	1950	89. 2	39 59.0	11	1649	88. 4	50
51	38 59.8	3	1959	89. 2	38 59.0	10	1658	88. 4	51
52	37 59.8	2	1969	89. 2	37 59.0	10	1668	88. 4	52
53	36 59.8	2	1979	89. 2	36 59.0	10	1678	88. 4	53
54	35 59.8	2	1989	89. 2	35 59.0	9	1688	88. 4	54
55	34 59.8	2	2000	89. 2	34 59.0	9	1699	88. 4	55
56	33 59.8	2	2010	89. 2	33 59.0	8	1710	88. 3	56
57	32 59.8	2	2022	89. 2	32 59.0	8	1721	88. 3	57
58	31 59.8	2	2034	89. 2	31 59.1	7	1733	88. 3	58
59	30 59.8	2	2046	89. 1	30 59.1	7	1745	88. 3	59
60	29 59.8	2	2059	89. 1	29 59.1	7	1758	88. 3	60
61	28 59.8	2	2072	89. 1	28 59.1	6	1771	88. 3	61
62	27 59.8	2	2086	89. 1	27 59.1	6	1786	88. 2	62
63	26 59.8	1	2102	89. 1	26 59.2	6	1800	88. 2	63
64	25 59.8	1	2116	89. 1	25 59.2	5	1815	88. 2	64
65	24 59.8	1	2132	89. 1	24 59.2	5	1831	88. 2	65

t° / L°	3° b	3° A	3° C	3° Z′	4° b	4° A	4° C	4° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	60	1281	90. 0	90 0.0	106	1156	90. 0	0
1	88 59.9	60	1281	90. 0	88 59.9	106	1156	89. 9	1
2	87 59.8	60	1281	89. 9	87 59.7	106	1157	89. 9	2
3	86 59.8	59	1282	89. 8	86 59.6	106	1157	89. 8	3
4	85 59.7	59	1282	89. 8	85 59.4	105	1158	89. 7	4
5	84 59.6	59	1283	89. 7	84 59.3	105	1158	89. 7	5
6	83 59.5	59	1284	89. 7	83 59.1	105	1159	89. 6	6
7	82 59.4	59	1284	89. 6	82 59.0	104	1160	89. 5	7
8	81 59.3	58	1286	89. 6	81 58.8	104	1161	89. 4	8
9	80 59.3	58	1287	89. 5	80 58.7	103	1162	89. 4	9
10	79 59.2	58	1288	89. 5	79 58.6	103	1163	89. 3	10
11	78 59.1	57	1289	89. 4	78 58.4	102	1164	89. 2	11
12	77 59.0	57	1291	89. 4	77 58.3	101	1166	89. 2	12
13	76 59.0	57	1292	89. 3	76 58.2	100	1168	89. 1	13
14	75 58.9	56	1294	89. 3	75 58.0	100	1169	89. 0	14
15	74 58.8	56	1296	89. 2	74 57.9	99	1171	89. 0	15
16	73 58.8	55	1298	89. 2	73 57.8	98	1174	88. 9	16
17	72 58.7	54	1301	89. 1	72 57.7	97	1176	88. 8	17
18	71 58.6	54	1303	89. 1	71 57.5	96	1178	88. 8	18
19	70 58.5	53	1305	89. 0	70 57.4	95	1181	88. 7	19
20	69 58.5	52	1308	89. 0	69 57.3	94	1183	88. 6	20
21	68 58.4	52	1311	88. 9	68 57.2	92	1186	88. 6	21
22	67 58.4	51	1314	88. 9	67 57.1	91	1189	88. 5	22
23	66 58.3	50	1317	88. 8	66 57.0	90	1192	88. 4	23
24	65 58.2	50	1321	88. 8	65 56.9	88	1196	88. 4	24
25	64 58.2	49	1324	88. 7	64 56.8	87	1199	88. 3	25
26	63 58.1	48	1327	88. 7	63 56.7	86	1203	88. 2	26
27	62 58.1	47	1331	88. 6	62 56.6	84	1208	88. 2	27
28	61 58.0	46	1335	88. 6	61 56.5	82	1210	88. 1	28
29	60 58.0	46	1339	88. 5	60 56.4	81	1215	88. 1	29
30	59 58.0	45	1344	88. 5	59 56.4	79	1219	88. 0	30
31	58 57.9	44	1348	88. 5	58 56.3	78	1223	87. 9	31
32	57 57.9	43	1353	88. 4	57 56.2	76	1228	87. 9	32
33	56 57.8	42	1358	88. 4	56 56.2	74	1233	87. 8	33
34	55 57.8	41	1363	88. 3	55 56.1	73	1238	87. 8	34
35	54 57.8	40	1368	88. 3	54 56.1	71	1243	87. 7	35
36	53 57.8	39	1373	88. 2	53 56.0	69	1248	87. 6	36
37	52 57.7	38	1379	88. 2	52 56.0	68	1254	87. 6	37
38	51 57.7	37	1385	88. 2	51 55.9	66	1260	87. 5	38
39	50 57.7	36	1391	88. 1	50 55.9	64	1266	87. 5	39
40	49 57.7	35	1397	88. 1	49 55.9	62	1272	87. 4	40
41	48 57.7	34	1403	88. 0	48 55.8	60	1279	87. 4	41
42	47 57.7	33	1410	88. 0	47 55.8	58	1285	87. 3	42
43	46 57.6	32	1417	88. 0	46 55.8	57	1292	87. 3	43
44	45 57.6	31	1424	87. 9	45 55.8	55	1299	87. 2	44
45	44 57.6	30	1432	87. 9	44 55.8	53	1307	87. 2	45
46	43 57.6	29	1439	87. 8	43 55.8	51	1315	87. 1	46
47	42 57.6	28	1448	87. 8	42 55.8	49	1323	87. 1	47
48	41 57.7	27	1456	87. 8	41 55.8	47	1331	87. 0	48
49	40 57.7	26	1464	87. 7	40 55.8	46	1339	87. 0	49
50	39 57.7	25	1473	87. 7	39 55.9	44	1348	86. 9	50
51	38 57.7	24	1483	87. 7	38 55.9	42	1357	86. 9	51
52	37 57.7	23	1492	87. 6	37 55.9	40	1367	86. 8	52
53	36 57.7	22	1502	87. 6	36 56.0	38	1377	86. 8	53
54	35 57.8	20	1512	87. 6	35 56.0	36	1387	86. 8	54
55	34 57.8	20	1523	87. 5	34 56.1	35	1398	86. 7	55
56	33 57.8	19	1534	87. 5	33 56.1	33	1409	86. 7	56
57	32 57.8	18	1545	87. 5	32 56.2	32	1420	86. 6	57
58	31 57.9	17	1557	87. 5	31 56.2	30	1432	86. 6	58
59	30 57.9	16	1569	87. 4	30 56.3	28	1445	86. 6	59
60	29 58.0	15	1582	87. 4	29 56.4	26	1454	86. 5	60
61	28 58.0	14	1596	87. 4	28 56.4	25	1471	86. 5	61
62	27 58.0	13	1609	87. 4	27 56.5	23	1485	86. 5	62
63	26 58.1	12	1624	87. 3	26 56.6	22	1499	86. 4	63
64	25 58.1	12	1639	87. 3	25 56.7	20	1515	86. 4	64
65	24 58.2	11	1656	87. 3	24 56.8	19	1530	86. 4	65

t° / L°	5° b	5° A	5° C	5° Z′	6° b	6° A	6° C	6° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	166	1060	90. 0	90 0.0	239	981	90. 0	0
1	88 59.8	166	1060	89. 9	88 59.7	238	981	89. 9	1
2	87 59.5	165	1060	89. 8	87 59.3	238	981	89. 8	2
3	86 59.3	165	1060	89. 7	86 59.0	238	981	89. 7	3
4	85 59.1	165	1061	89. 7	85 58.7	237	982	89. 6	4
5	84 58.9	164	1061	89. 6	84 58.4	236	982	89. 5	5
6	83 58.6	164	1062	89. 5	83 58.0	236	983	89. 4	6
7	82 58.4	163	1063	89. 4	82 57.7	235	984	89. 3	7
8	81 58.2	162	1064	89. 3	81 57.4	234	985	89. 2	8
9	80 58.0	162	1065	89. 2	80 57.1	233	986	89. 1	9
10	79 57.8	161	1066	89. 1	79 56.8	231	987	89. 0	10
11	78 57.5	160	1068	89. 0	78 56.5	230	989	88. 9	11
12	77 57.3	158	1069	89. 0	77 56.2	228	990	88. 7	12
13	76 57.1	157	1071	88. 9	76 55.9	226	992	88. 6	13
14	75 56.9	156	1073	88. 8	75 55.6	225	994	88. 5	14
15	74 56.7	154	1075	88. 7	74 55.3	222	996	88. 4	15
16	73 56.5	153	1077	88. 6	73 55.0	220	998	88. 3	16
17	72 56.3	152	1079	88. 5	72 54.7	218	1000	88. 2	17
18	71 56.1	150	1081	88. 5	71 54.4	216	1003	88. 1	18
19	70 56.0	148	1084	88. 4	70 54.2	213	1005	88. 0	19
20	69 55.8	146	1087	88. 3	69 53.9	210	1008	87. 9	20
21	68 55.6	144	1090	88. 2	68 53.7	208	1011	87. 8	21
22	67 55.4	142	1093	88. 1	67 53.4	205	1014	87. 7	22
23	66 55.3	140	1096	88. 0	66 53.2	202	1017	87. 6	23
24	65 55.1	138	1099	88. 0	65 53.0	199	1020	87. 6	24
25	64 55.0	136	1102	87. 9	64 52.8	196	1023	87. 5	25
26	63 54.8	134	1106	87. 8	63 52.5	193	1027	87. 4	26
27	62 54.7	131	1110	87. 7	62 52.3	189	1031	87. 3	27
28	61 54.6	129	1114	87. 6	61 52.2	186	1035	87. 2	28
29	60 54.4	127	1118	87. 6	60 52.0	182	1039	87. 1	29
30	59 54.3	124	1122	87. 5	59 51.8	179	1043	87. 0	30
31	58 54.2	122	1127	87. 4	58 51.6	175	1048	86. 9	31
32	57 54.1	119	1131	87. 3	57 51.5	171	1052	86. 8	32
33	56 54.0	116	1136	87. 3	56 51.4	168	1057	86. 7	33
34	55 53.9	114	1141	87. 2	55 51.2	164	1062	86. 6	34
35	54 53.8	111	1146	87. 1	54 51.1	160	1067	86. 6	35
36	53 53.8	108	1152	87. 1	53 51.0	156	1073	86. 5	36
37	52 53.7	106	1157	87. 0	52 50.9	152	1078	86. 4	37
38	51 53.6	103	1163	86. 9	51 50.8	148	1084	86. 3	38
39	50 53.6	100	1169	86. 8	50 50.8	144	1090	86. 2	39
40	49 53.5	97	1175	86. 8	49 50.7	140	1096	86. 1	40
41	48 53.5	94	1182	86. 7	48 50.6	136	1103	86. 1	41
42	47 53.5	91	1189	86. 7	47 50.6	131	1110	86. 0	42
43	46 53.5	89	1196	86. 6	46 50.6	127	1117	85. 9	43
44	45 53.4	86	1203	86. 5	45 50.6	123	1124	85. 8	44
45	44 53.4	83	1210	86. 5	44 50.6	119	1131	85. 8	45
46	43 53.4	80	1218	86. 4	43 50.6	115	1139	85. 7	46
47	42 53.5	77	1226	86. 3	42 50.6	111	1147	85. 6	47
48	41 53.5	74	1234	86. 3	41 50.6	107	1155	85. 5	48
49	40 53.5	71	1243	86. 2	40 50.6	102	1164	85. 5	49
50	39 53.5	68	1252	86. 2	39 50.7	98	1173	85. 4	50
51	38 53.6	65	1261	86. 1	38 50.8	94	1182	85. 3	51
52	37 53.6	63	1271	86. 1	37 50.8	90	1191	85. 3	52
53	36 53.7	60	1280	86. 0	36 50.9	86	1201	85. 2	53
54	35 53.8	57	1290	86. 0	35 51.0	82	1212	85. 1	54
55	34 53.8	54	1301	85. 9	34 51.1	78	1222	85. 1	55
56	33 53.9	52	1312	85. 9	33 51.3	74	1233	85. 0	56
57	32 54.0	49	1324	85. 8	32 51.4	70	1245	85. 0	57
58	31 54.1	46	1336	85. 8	31 51.5	67	1257	84. 9	58
59	30 54.2	44	1348	85. 7	30 51.7	63	1269	84. 9	59
60	29 54.3	41	1361	85. 7	29 51.8	59	1282	84. 8	60
61	28 54.4	39	1374	85. 6	28 52.0	56	1295	84. 7	61
62	27 54.6	37	1388	85. 6	27 52.2	52	1309	84. 7	62
63	26 54.7	34	1403	85. 5	26 52.4	49	1324	84. 7	63
64	25 54.8	32	1418	85. 5	25 52.6	46	1339	84. 6	64
65	24 55.0	30	1434	85. 5	24 52.8	42	1355	84. 6	65

t° / L°	7° b	7° A	7° C	7° Z′	8° b	8° A	8° C	8° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	325	914	90. 0	90 0.0	425	856	90. 0	0
1	88 59.5	325	914	89. 9	88 59.4	425	856	89. 9	1
2	87 59.1	324	914	89. 8	87 58.8	424	857	89. 7	2
3	86 58.7	324	915	89. 6	86 58.2	424	857	89. 6	3
4	85 58.2	323	915	89. 5	85 57.6	423	857	89. 4	4
5	84 57.8	322	916	89. 4	84 57.1	422	858	89. 3	5
6	83 57.3	321	916	89. 3	83 56.5	420	859	89. 2	6
7	82 56.9	320	917	89. 2	82 55.9	418	860	89. 0	7
8	81 56.4	319	918	89. 0	81 55.3	417	861	88. 9	8
9	80 56.0	317	919	88. 9	80 54.8	414	862	88. 7	9
10	79 55.6	315	921	88. 8	79 54.2	412	863	88. 6	10
11	78 55.2	313	922	88. 7	78 53.7	409	865	88. 5	11
12	77 54.8	311	924	88. 5	77 53.1	406	866	88. 3	12
13	76 54.3	308	925	88. 4	76 52.6	403	868	88. 2	13
14	75 53.9	306	927	88. 3	75 52.1	400	870	88. 1	14
15	74 53.5	303	929	88. 2	74 51.6	396	872	87. 9	15
16	73 53.2	300	931	88. 1	73 51.1	392	873	87. 8	16
17	72 52.8	297	933	87. 9	72 50.6	388	876	87. 6	17
18	71 52.4	294	936	87. 8	71 50.1	383	878	87. 5	18
19	70 52.1	290	938	87. 7	70 49.6	379	881	87. 4	19
20	69 51.7	287	941	87. 6	69 49.2	375	883	87. 2	20
21	68 51.4	283	944	87. 5	68 48.7	370	886	87. 1	21
22	67 51.0	279	947	87. 4	67 48.3	365	889	87. 0	22
23	66 50.7	275	950	87. 3	66 47.9	359	892	86. 9	23
24	65 50.4	271	953	87. 1	65 47.5	354	896	86. 7	24
25	64 50.1	266	957	87. 0	64 47.1	348	899	86. 6	25
26	63 49.8	262	960	86. 9	63 46.7	342	903	86. 5	26
27	62 49.6	258	964	86. 8	62 46.4	336	907	86. 4	27
28	61 49.3	253	968	86. 7	61 46.0	330	911	86. 2	28
29	60 49.1	248	972	86. 6	60 45.7	324	915	86. 1	29
30	59 48.8	243	977	86. 5	59 45.4	318	919	86. 0	30
31	58 48.6	238	981	86. 4	58 45.1	311	923	85. 9	31
32	57 48.4	233	986	86. 3	57 44.9	305	928	85. 7	32
33	56 48.2	228	990	86. 2	56 44.6	298	933	85. 6	33
34	55 48.1	223	996	86. 1	55 44.4	291	938	85. 5	34
35	54 47.9	218	1001	86. 0	54 44.2	284	943	85. 4	35
36	53 47.8	212	1006	85. 9	53 44.0	277	948	85. 3	36
37	52 47.6	207	1012	85. 8	52 43.8	270	954	85. 2	37
38	51 47.5	201	1018	85. 7	51 43.7	263	960	85. 1	38
39	50 47.4	196	1024	85. 6	50 43.5	256	966	84. 9	39
40	49 47.3	190	1030	85. 5	49 43.4	248	972	84. 8	40
41	48 47.3	184	1036	85. 4	48 43.3	241	979	84. 7	41
42	47 47.2	179	1043	85. 3	47 43.3	234	985	84. 6	42
43	46 47.2	173	1050	85. 2	46 43.2	226	992	84. 5	43
44	45 47.1	168	1057	85. 1	45 43.2	219	1000	84. 4	44
45	44 47.1	162	1065	85. 0	44 43.2	211	1007	84. 3	45
46	43 47.1	156	1072	85. 0	43 43.2	204	1015	84. 2	46
47	42 47.2	150	1080	84. 9	42 43.2	197	1023	84. 1	47
48	41 47.2	145	1089	84. 8	41 43.3	189	1031	84. 0	48
49	40 47.3	139	1097	84. 7	40 43.4	182	1040	83. 9	49
50	39 47.3	133	1106	84. 6	39 43.5	174	1049	83. 9	50
51	38 47.4	128	1115	84. 6	38 43.6	167	1058	83. 8	51
52	37 47.5	123	1125	84. 5	37 43.7	160	1067	83. 7	52
53	36 47.6	117	1135	84. 4	36 43.9	153	1077	83. 6	53
54	35 47.8	112	1145	84. 3	35 44.0	146	1087	83. 5	54
55	34 47.9	106	1156	84. 3	34 44.2	139	1098	83. 4	55
56	33 48.1	101	1166	84. 2	33 44.4	132	1109	83. 4	56
57	32 48.3	96	1178	84. 1	32 44.7	125	1120	83. 3	57
58	31 48.5	91	1190	84. 1	31 44.9	118	1135	83. 2	58
59	30 48.7	86	1202	84. 0	30 45.2	112	1145	83. 1	59
60	29 48.9	81	1215	83. 9	29 45.5	105	1158	83. 1	60
61	28 49.1	76	1229	83. 9	28 45.8	99	1171	83. 0	61
62	27 49.4	71	1242	83. 8	27 46.1	93	1185	82. 9	62
63	26 49.6	67	1257	83. 8	26 46.4	87	1199	82. 9	63
64	25 49.9	62	1272	83. 7	25 46.8	81	1215	82. 8	64
65	24 50.2	58	1288	83. 7	24 47.2	75	1231	82. 7	65

20143°°—40——2

L° \ t°	9° b	9° A	9° C	9° Z′	10° b	10° A	10° C	10° Z′	L° \ t°
	° ′			°	° ′			°	
0	**90 0.0**	538	806	90. 0	**90 0.0**	665	760	90. 0	0
1	**88 59.3**	538	806	89. 8	**88 59.1**	665	760	89. 8	1
2	**87 58.5**	537	806	89. 7	**87 58.2**	664	760	89. 6	2
3	**86 57.8**	537	806	89. 5	**86 57.2**	663	761	89. 5	3
4	**85 57.0**	535	806	89. 4	**85 56.3**	662	761	89. 3	4
5	**84 56.3**	534	807	89. 2	**84 55.4**	660	762	89. 1	5
6	**83 55.5**	532	808	89. 1	**83 54.5**	658	762	88. 9	6
7	**82 54.8**	530	809	88. 9	**82 53.6**	655	764	88. 8	7
8	**81 54.1**	528	810	88. 7	**81 52.7**	652	764	88. 6	8
9	**80 53.4**	525	811	88. 6	**80 51.8**	648	765	88. 4	9
10	**79 52.7**	521	812	88. 4	**79 50.9**	645	767	88. 2	10
11	**78 52.0**	518	814	88. 3	**78 50.1**	640	768	88. 1	11
12	**77 51.3**	514	815	88. 1	**77 49.2**	636	770	87. 9	12
13	**76 50.6**	510	817	88. 0	**76 48.4**	631	771	87. 7	13
14	**75 49.9**	506	819	87. 8	**75 47.6**	625	773	87. 6	14
15	**74 49.3**	502	820	87. 7	**74 46.8**	620	775	87. 4	15
16	**73 48.7**	497	823	87. 5	**73 46.0**	614	777	87. 2	16
17	**72 48.0**	492	825	87. 3	**72 45.2**	607	779	87. 0	17
18	**71 47.4**	486	827	87. 2	**71 44.4**	600	782	86. 9	18
19	**70 46.8**	480	830	87. 0	**70 43.7**	593	785	86. 7	19
20	**69 46.2**	474	832	86. 9	**69 43.0**	586	787	86. 5	20
21	**68 45.7**	468	835	86. 8	**68 42.3**	578	790	86. 4	21
22	**67 45.1**	462	839	86. 6	**67 41.6**	570	793	86. 2	22
23	**66 44.6**	455	841	86. 5	**66 41.0**	562	796	86. 1	23
24	**65 44.1**	448	845	86. 3	**65 40.3**	554	799	85. 9	24
25	**64 43.6**	441	848	86. 2	**64 39.7**	545	803	85. 7	25
26	**63 43.2**	434	852	86. 0	**63 39.2**	536	806	85. 6	26
27	**62 42.7**	426	856	85. 9	**62 38.6**	526	810	85. 4	27
28	**61 42.3**	418	860	85. 7	**61 38.1**	517	815	85. 3	28
29	**60 41.9**	410	864	85. 6	**60 37.6**	507	819	85. 1	29
30	**59 41.5**	402	868	85. 5	**59 37.1**	497	823	85. 0	30
31	**58 41.1**	394	873	85. 3	**58 36.7**	486	827	84. 8	31
32	**57 40.8**	386	877	85. 2	**57 36.3**	476	832	84. 7	32
33	**56 40.5**	377	882	85. 1	**56 35.9**	466	837	84. 5	33
34	**55 40.2**	368	887	84. 9	**55 35.5**	455	841	84. 4	34
35	**54 39.9**	359	892	84. 8	**54 35.2**	444	847	84. 2	35
36	**53 39.7**	351	898	84. 7	**53 34.9**	433	852	84. 1	36
37	**52 39.5**	342	903	84. 6	**52 34.7**	422	858	83. 9	37
38	**51 39.3**	332	909	84. 4	**51 34.4**	410	864	83. 8	38
39	**50 39.1**	323	915	84. 3	**50 34.2**	399	870	83. 7	39
40	**49 39.0**	314	921	84. 2	**49 34.0**	388	876	83. 5	40
41	**48 38.9**	305	928	84. 1	**48 33.9**	376	882	83. 4	41
42	**47 38.8**	296	935	84. 0	**47 33.8**	365	889	83. 3	42
43	**46 38.7**	286	942	83. 8	**46 33.7**	353	896	83. 1	43
44	**45 38.7**	277	949	83. 7	**45 33.7**	342	903	83. 0	44
45	**44 38.7**	267	956	83. 6	**44 33.7**	330	911	82. 9	45
46	**43 38.7**	258	964	83. 5	**43 33.7**	318	918	82. 8	46
47	**42 38.8**	249	972	83. 4	**42 33.8**	307	926	82. 7	47
48	**41 38.8**	239	980	83. 3	**41 33.8**	295	935	82. 5	48
49	**40 38.9**	230	989	83. 2	**40 34.0**	283	943	82. 4	49
50	**39 39.1**	221	998	83. 1	**39 34.1**	272	952	82. 3	50
51	**38 39.2**	212	1007	83. 0	**38 34.3**	261	962	82. 2	51
52	**37 39.4**	202	1016	82. 9	**37 34.5**	250	971	82. 1	52
53	**36 39.6**	193	1026	82. 8	**36 34.8**	238	981	82. 0	53
54	**35 39.8**	184	1037	82. 7	**35 35.0**	227	991	81. 9	54
55	**34 40.0**	176	1047	82. 6	**34 35.3**	216	1002	81. 8	55
56	**33 40.3**	167	1058	82. 5	**33 35.7**	206	1013	81. 7	56
57	**32 40.6**	158	1069	82. 4	**32 36.0**	195	1024	81. 6	57
58	**31 40.9**	150	1081	82. 4	**31 36.4**	185	1036	81. 5	58
59	**30 41.3**	141	1094	82. 3	**30 36.9**	174	1049	81. 4	59
60	**29 41.6**	133	1107	82. 2	**29 37.3**	164	1061	81. 3	60
61	**28 42.0**	125	1120	82. 1	**28 37.8**	154	1075	81. 2	61
62	**27 42.4**	117	1134	82. 0	**27 38.3**	145	1089	81. 2	62
63	**26 42.8**	110	1149	82. 0	**26 38.8**	135	1103	81. 1	63
64	**25 43.3**	102	1164	81. 9	**25 39.4**	126	1119	81. 0	64
65	**24 43.8**	95	1180	81. 8	**24 39.9**	117	1134	80. 9	65

t° / L°	11° b	11° A	11° C	11° Z′	12° b	12° A	12° C	12° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	805	719	90. 0	90 0.0	960	682	90. 0	0
1	88 58.9	805	719	89. 8	88 58.7	959	682	89. 8	1
2	87 57.8	804	719	89. 6	87 57.3	958	682	89. 6	2
3	86 56.6	803	720	89. 4	86 56.0	957	683	89. 4	3
4	85 55.5	801	720	89. 2	85 54.7	955	683	89. 2	4
5	84 54.4	799	721	89. 0	84 53.3	952	684	88. 9	5
6	83 53.3	796	722	88. 8	83 52.0	949	685	88. 7	6
7	82 52.2	793	723	88. 6	82 50.7	945	685	88. 5	7
8	81 51.1	790	723	88. 5	81 49.4	941	686	88. 3	8
9	80 50.1	785	725	88. 3	80 48.1	936	688	88. 1	9
10	79 49.0	781	726	88. 1	79 46.9	930	689	87. 9	10
11	78 48.0	776	727	87. 9	78 45.6	924	690	87. 7	11
12	77 46.9	770	729	87. 7	77 44.4	917	692	87. 5	12
13	76 45.9	764	731	87. 5	76 43.2	910	693	87. 3	13
14	75 44.9	757	732	87. 3	75 42.0	902	695	87. 1	14
15	74 43.9	751	734	87. 1	74 40.8	894	697	86. 9	15
16	73 43.0	743	737	86. 9	73 39.7	885	699	86. 6	16
17	72 42.0	735	739	86. 7	72 38.6	876	701	86. 4	17
18	71 41.1	727	741	86. 6	71 37.5	866	704	86. 2	18
19	70 40.2	719	743	86. 4	70 36.4	856	707	86. 0	19
20	69 39.4	710	746	86. 2	69 35.4	845	709	85. 8	20
21	68 38.5	700	749	86. 0	68 34.4	834	712	85. 6	21
22	67 37.7	690	752	85. 8	67 33.4	822	715	85. 4	22
23	66 36.9	680	755	85. 7	66 32.5	810	718	85. 3	23
24	65 36.2	670	759	85. 5	65 31.6	798	721	85. 1	24
25	64 35.4	659	762	85. 3	64 30.7	785	725	84. 9	25
26	63 34.7	648	765	85. 1	63 29.9	772	728	84. 7	26
27	62 34.1	637	770	85. 0	62 29.1	758	732	84. 5	27
28	61 33.4	625	773	84. 8	61 28.3	744	736	84. 3	28
29	60 32.8	613	778	84. 6	60 27.6	730	740	84. 1	29
30	59 32.3	601	782	84. 4	59 26.9	716	744	83. 9	30
31	58 31.7	589	783	84. 3	58 26.3	701	749	83. 8	31
32	57 31.2	576	791	84. 1	57 25.7	686	753	83. 6	32
33	56 30.8	563	795	84. 0	56 25.2	670	758	83. 4	33
34	55 30.3	550	801	83. 8	55 24.6	655	763	83. 2	34
35	54 30.0	537	806	83. 6	54 24.2	639	769	83. 0	35
36	53 29.6	524	811	83. 5	53 23.8	623	774	82. 9	36
37	52 29.3	510	817	83. 3	52 23.4	607	780	82. 7	37
38	51 29.0	497	823	83. 2	51 23.1	591	785	82. 5	38
39	50 28.8	483	829	83. 0	50 22.8	574	792	82. 4	39
40	49 28.6	469	835	82. 9	49 22.5	558	798	82. 2	40
41	48 28.4	455	842	82. 7	48 22.3	541	804	82. 1	41
42	47 28.3	441	848	82. 6	47 22.2	525	811	81. 9	42
43	46 28.2	427	856	82. 4	46 22.1	508	818	81. 8	43
44	45 28.1	413	862	82. 3	45 22.0	491	825	81. 6	44
45	44 28.1	399	870	82. 2	44 22.0	474	832	81. 5	45
46	43 28.2	385	878	82. 0	43 22.1	458	840	81. 3	46
47	42 28.2	371	885	81. 9	42 22.1	441	848	81. 2	47
48	41 28.3	357	894	81. 8	41 22.3	424	856	81. 0	48
49	40 28.5	343	902	81. 7	40 22.4	408	865	80. 9	49
50	39 28.7	329	911	81. 5	39 22.7	391	874	80. 8	50
51	38 28.9	315	920	81. 4	38 22.9	375	883	80. 6	51
52	37 29.1	302	930	81. 3	37 23.2	359	893	80. 5	52
53	36 29.4	288	940	81. 2	36 23.6	343	902	80. 4	53
54	35 29.8	275	950	81. 1	35 24.0	327	913	80. 2	54
55	34 30.1	262	961	81. 0	34 24.4	311	923	80. 1	55
56	33 30.5	249	971	80. 8	33 24.9	296	934	80. 0	56
57	32 31.0	236	983	80. 7	32 25.5	280	946	79. 9	57
58	31 31.5	223	995	80. 6	31 26.0	265	958	79. 8	58
59	30 32.0	211	1008	80. 5	30 26.6	250	970	79. 7	59
60	29 32.5	199	1021	80. 4	29 27.3	236	983	79. 6	60
61	28 33.1	187	1034	80. 4	28 28.0	222	997	79. 5	61
62	27 33.7	175	1048	80. 3	27 28.7	208	1011	79. 4	62
63	26 34.4	164	1062	80. 2	26 29.5	194	1025	79. 3	63
64	25 35.0	152	1078	80. 1	25 30.3	181	1040	79. 2	64
65	24 35.7	142	1093	80. 0	24 31.1	168	1056	79. 1	65

t° / L°	13° b	13° A	13° C	13° Z′	14° b	14° A	14° C	14° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	1128	648	90. 0	90 0.0	1310	616	90. 0	0
1	88 58.4	1127	648	89. 8	88 58.2	1309	616	89. 8	1
2	87 56.8	1126	648	89. 5	87 56.3	1308	616	89. 5	2
3	86 55.3	1124	648	89. 3	86 54.5	1306	617	89. 3	3
4	85 53.7	1122	649	89. 1	85 52.7	1303	617	89. 0	4
5	84 52.2	1119	649	88. 8	84 50.9	1299	618	88. 8	5
6	83 50.6	1115	650	88. 6	83 49.1	1295	618	88. 5	6
7	82 49.1	1110	651	88. 4	82 47.3	1290	619	88. 3	7
8	81 47.5	1105	652	88. 2	81 45.5	1284	620	88. 0	8
9	80 46.0	1099	653	87. 9	80 43.8	1277	621	87. 8	9
10	79 44.5	1093	654	87. 7	79 42.0	1269	623	87. 5	10
11	78 43.1	1086	656	87. 5	78 40.3	1260	624	87. 3	11
12	77 41.6	1078	657	87. 3	77 38.6	1251	626	87. 0	12
13	76 40.2	1069	659	87. 0	76 37.0	1241	628	86. 8	13
14	75 38.8	1060	661	86. 8	75 35.3	1231	629	86. 5	14
15	74 37.4	1050	663	86. 6	74 33.7	1219	631	86. 3	15
16	73 36.1	1040	665	86. 4	73 32.2	1207	633	86. 1	16
17	72 34.8	1029	667	86. 1	72 30.7	1194	636	85. 8	17
18	71 33.5	1017	670	85. 9	71 29.2	1181	638	85. 6	18
19	70 32.2	1005	672	85. 7	70 27.7	1167	640	85. 4	19
20	69 31.0	993	675	85. 5	69 26.3	1152	643	85. 1	20
21	68 29.8	980	677	85. 3	68 24.9	1137	646	84. 9	21
22	67 28.7	965	680	85. 1	67 23.6	1121	649	84. 7	22
23	66 27.6	952	684	84. 8	66 22.3	1104	652	84. 4	23
24	65 26.5	937	687	84. 6	65 21.1	1087	655	84. 2	24
25	64 25.5	922	691	84. 4	64 19.9	1070	659	84. 0	25
26	63 24.6	906	694	84. 2	63 18.8	1052	662	83. 8	26
27	62 23.6	890	698	84. 0	62 17.7	1033	666	83. 5	27
28	61 22.7	874	702	83. 8	61 16.7	1014	670	83. 3	28
29	60 21.9	857	706	83. 6	60 15.7	995	674	83. 1	29
30	59 21.1	840	710	83. 4	59 14.8	975	679	82. 9	30
31	58 20.4	823	715	83. 2	58 13.8	954	683	82. 7	31
32	57 19.7	805	719	83. 0	57 13.1	934	688	82. 5	32
33	56 19.0	787	724	82. 8	56 12.4	913	692	82. 3	33
34	55 18.4	769	729	82. 6	55 11.7	892	698	82. 1	34
35	54 17.9	750	735	82. 5	54 11.0	870	703	81. 9	35
36	53 17.4	731	740	82. 3	53 10.5	848	708	81. 7	36
37	52 17.0	712	746	82. 1	52 10.0	826	714	81. 5	37
38	51 16.6	693	751	81. 9	51 9.5	804	720	81. 3	38
39	50 16.2	674	757	81. 7	50 9.2	782	725	81. 1	39
40	49 16.0	655	763	81. 6	49 8.8	759	732	80. 9	40
41	48 15.7	635	770	81. 4	48 8.6	736	738	80. 7	41
42	47 15.6	616	777	81. 2	47 8.4	714	745	80. 5	42
43	46 15.4	596	783	81. 1	46 8.2	691	752	80. 4	43
44	45 15.4	576	791	80. 9	45 8.2	668	760	80. 2	44
45	44 15.4	556	798	80. 7	44 8.2	645	767	80. 0	45
46	43 15.4	537	806	80. 6	43 8.2	622	774	79. 8	46
47	42 15.5	517	814	80. 6	42 8.4	599	782	79. 7	47
48	41 15.7	498	822	80. 3	41 8.5	577	791	79. 5	48
49	40 15.9	478	831	80. 1	40 8.8	554	799	79. 4	49
50	39 16.2	459	840	80. 0	39 9.1	532	808	79. 2	50
51	38 16.5	440	849	79. 8	38 9.5	509	817	79. 0	51
52	37 16.8	420	858	79. 7	37 9.9	487	827	78. 9	52
53	36 17.3	402	868	79. 6	36 10.4	465	837	78. 7	53
54	35 17.7	383	879	79. 4	35 10.9	444	847	78. 6	54
55	34 18.3	365	889	79. 3	34 11.6	422	857	78. 5	55
56	33 18.8	346	900	79. 2	33 12.2	401	868	78. 3	56
57	32 19.4	328	912	79. 0	32 12.9	380	880	78. 2	57
58	31 20.1	311	924	78. 9	31 13.7	360	892	78. 1	58
59	30 20.8	294	936	78. 8	30 14.6	340	904	77. 9	59
60	29 21.6	276	948	78. 7	29 15.5	320	917	77. 8	60
61	28 22.4	260	962	78. 6	28 16.4	301	931	77. 7	61
62	27 23.2	244	976	78. 5	27 17.4	282	945	77. 6	62
63	26 24.2	228	991	78. 4	26 18.4	263	959	77. 5	63
64	25 25.1	212	1006	78. 3	25 19.5	246	974	77. 4	64
65	24 26.1	197	1022	78. 2	24 20.7	228	990	77. 3	65

t° / L°	15° b	15° A	15° C	15° Z′	16° b	16° A	16° C	16° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	1506	587	90. 0	90 0.0	1716	560	90. 0	0
1	88 57.9	1505	587	89. 7	88 57.6	1715	560	89. 7	1
2	87 55.8	1504	587	89. 5	87 55.2	1714	560	89. 4	2
3	86 53.7	1501	587	89. 2	86 52.8	1711	560	89. 1	3
4	85 51.6	1498	588	88. 9	85 50.4	1707	561	88. 9	4
5	84 49.5	1494	588	88. 7	84 48.0	1702	561	88. 6	5
6	83 47.4	1489	589	88. 4	83 45.6	1696	562	88. 3	6
7	82 45.3	1482	590	88. 1	82 43.3	1689	563	88. 0	7
8	81 43.3	1475	591	87. 9	81 40.9	1681	564	87. 7	8
9	80 41.3	1468	592	87. 6	80 38.6	1672	565	87. 4	9
10	79 39.3	1459	594	87. 3	79 36.3	1662	566	87. 2	10
11	78 37.3	1449	595	87. 1	78 34.1	1651	568	86. 9	11
12	77 35.4	1439	597	86. 8	77 31.9	1639	569	86. 6	12
13	76 33.5	1427	598	86. 6	76 29.7	1626	571	86. 3	13
14	75 31.6	1415	600	86. 3	75 27.6	1612	573	86. 0	14
15	74 29.8	1401	602	86. 0	74 25.5	1597	574	85. 8	15
16	73 28.0	1388	604	85. 8	73 23.4	1581	577	85. 5	16
17	72 26.2	1373	606	85. 5	72 21.4	1564	579	85. 2	17
18	71 24.5	1357	609	85. 3	71 19.4	1546	581	84. 9	18
19	70 22.8	1341	611	85. 0	70 17.5	1527	584	84. 7	19
20	69 21.2	1324	614	84. 8	69 15.7	1508	587	84. 4	20
21	68 19.6	1306	617	84. 5	68 13.9	1488	589	84. 1	21
22	67 18.1	1288	620	84. 3	67 12.2	1467	592	83. 9	22
23	66 16.6	1269	623	84. 0	66 10.5	1445	596	83. 6	23
24	65 15.2	1249	626	83. 8	65 8.9	1422	598	83. 3	24
25	64 13.8	1229	630	83. 5	64 7.3	1399	602	83. 1	25
26	63 12.5	1208	633	83. 3	63 5.8	1375	606	82. 8	26
27	62 11.3	1187	637	83. 1	62 4.4	1351	610	82. 6	27
28	61 10.1	1165	641	82. 8	61 3.1	1326	613	82. 3	28
29	60 9.0	1142	645	82. 6	60 1.8	1300	618	82. 1	29
30	59 8.0	1119	649	82. 4	59 0.6	1274	622	81. 8	30
31	58 7.0	1096	653	82. 1	57 59.5	1247	626	81. 6	31
32	57 6.0	1072	658	81. 9	56 58.4	1220	631	81. 4	32
33	56 5.2	1048	663	81. 7	55 57.5	1193	636	81. 1	33
34	55 4.4	1024	668	81. 5	54 56.6	1165	641	80. 9	34
35	54 3.7	999	673	81. 3	53 55.8	1136	646	80. 7	35
36	53 3.0	974	679	81. 1	52 55.0	1108	651	80. 4	36
37	52 2.5	948	685	80. 8	51 54.4	1079	657	80. 2	37
38	51 1.9	923	690	80. 6	50 53.8	1049	663	80. 0	38
39	50 1.5	897	696	80. 4	49 53.3	1020	669	79. 8	39
40	49 1.1	871	702	80. 2	48 52.9	990	675	79. 6	40
41	48 0.9	845	709	80. 0	47 52.6	961	682	79. 3	41
42	47 0.6	819	716	79. 8	46 52.3	931	688	79. 1	42
43	46 0.5	792	723	79. 6	45 52.2	901	695	78. 9	43
44	45 0.4	766	730	79. 5	44 52.1	871	702	78. 7	44
45	44 0.4	740	737	79. 3	43 52.1	841	710	78. 5	45
46	43 0.5	714	745	79. 1	42 52.2	811	718	78. 3	46
47	42 0.6	687	753	78. 9	41 52.4	781	725	78. 2	47
48	41 0.9	661	761	78. 7	40 52.6	752	734	78. 0	48
49	40 1.1	635	770	78. 6	39 53.0	722	742	77. 8	49
50	39 1.5	610	779	78. 4	38 53.4	693	751	77. 6	50
51	38 1.9	584	788	78. 2	37 53.9	663	761	77. 4	51
52	37 2.4	559	797	78. 1	36 54.4	634	770	77. 3	52
53	36 3.0	533	807	77. 9	35 55.1	606	780	77. 1	53
54	35 3.6	508	817	77. 8	34 55.8	578	790	76. 9	54
55	34 4.3	484	828	77. 6	33 56.6	550	801	76. 8	55
56	33 5.1	460	839	77. 5	32 57.5	522	812	76. 6	56
57	32 6.0	436	851	77. 4	31 58.5	495	823	76. 5	57
58	31 6.9	412	862	77. 2	30 59.5	468	835	76. 3	58
59	30 7.8	389	875	77. 1	30 0.6	442	848	76. 2	59
60	29 8.8	367	888	76. 9	29 1.8	416	860	76. 1	60
61	28 9.9	345	901	76. 8	28 3.0	391	874	75. 9	61
62	27 11.1	323	915	76. 7	27 4.3	367	888	75. 8	62
63	26 12.3	302	930	76. 6	26 5.7	343	903	75. 7	63
64	25 13.5	281	945	76. 5	25 7.1	319	918	75. 5	64
65	24 14.9	261	961	76 4	24 8.6	297	934	75. 4	65

t° / L°	17° b	17° A	17° C	17° Z′	18° b	18° A	18° C	18° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	1940	534	90. 0	90 0.0	2179	510	90. 0	0
1	88 57.3	1940	534	89. 7	88 56.9	2178	510	89. 7	1
2	87 54.5	1938	534	89. 4	87 53.8	2176	510	89. 4	2
3	86 51.8	1935	534	89. 1	86 50.8	2173	510	89. 0	3
4	85 49.1	1930	535	88. 8	85 47.7	2168	511	88. 7	4
5	84 46.4	1925	536	88. 5	84 44.6	2162	512	88. 4	5
6	83 43.7	1918	536	88. 2	83 41.6	2155	512	88. 1	6
7	82 41.0	1911	537	87. 9	82 38.6	2146	513	87. 7	7
8	81 38.4	1901	538	87. 6	81 35.6	2134	514	87. 4	8
9	80 35.8	1890	539	87. 3	80 32.7	2123	515	87. 1	9
10	79 33.2	1879	541	87. 0	79 29.8	2110	517	86. 8	10
11	78 30.6	1867	542	86. 7	78 26.9	2096	518	86. 5	11
12	77 28.1	1853	543	86. 4	77 24.1	2080	519	86. 1	12
13	76 25.7	1838	545	86. 1	76 21.3	2064	521	85. 8	13
14	75 23.2	1822	547	85. 8	75 18.6	2046	523	85. 5	14
15	74 20.9	1805	549	85. 5	74 15.9	2026	525	85. 2	15
16	73 18.5	1786	551	85. 2	73 13.3	2006	527	84. 9	16
17	72 16.3	1768	553	84. 9	72 10.8	1984	529	84. 6	17
18	71 14.0	1748	556	84. 6	71 8.3	1962	532	84. 3	18
19	70 11.9	1726	558	84. 3	70 5.8	1938	534	84. 0	19
20	69 9.8	1704	561	84. 0	69 3.5	1913	537	83. 7	20
21	68 7.8	1681	564	83. 7	68 1.2	1887	539	83. 4	21
22	67 5.8	1657	567	83. 5	66 59.0	1860	543	83. 1	22
23	66 3.9	1632	570	83. 2	65 56.9	1832	546	82. 8	23
24	65 2.1	1607	573	82. 9	64 54.8	1803	549	82. 5	24
25	64 0.3	1581	577	82. 6	63 52.9	1774	553	82. 2	25
26	62 58.7	1553	580	82. 4	62 51.0	1743	556	81. 9	26
27	61 57.1	1526	584	82. 1	61 49.2	1712	560	81. 6	27
28	60 55.5	1497	588	81. 8	60 47.5	1680	564	81. 3	28
29	59 54.1	1469	592	81. 6	59 45.9	1647	568	81. 0	29
30	58 52.8	1439	596	81. 3	58 44.4	1613	572	80. 8	30
31	57 51.5	1409	601	81. 1	57 43.0	1580	577	80. 5	31
32	56 50.3	1378	605	80. 8	56 41.6	1545	581	80. 2	32
33	55 49.2	1346	610	80. 5	55 40.4	1510	586	80. 0	33
34	54 48.2	1315	615	80. 3	54 39.3	1474	591	79. 7	34
35	53 47.3	1282	620	80. 1	53 38.3	1438	597	79. 4	35
36	52 46.5	1250	626	79. 8	52 37.4	1401	602	79. 2	36
37	51 45.7	1218	631	79. 6	51 36.5	1365	607	78. 9	37
38	50 45.1	1185	637	79. 3	50 35.8	1327	613	78. 7	38
39	49 44.6	1151	644	79. 1	49 35.2	1290	619	78. 4	39
40	48 44.1	1117	650	78. 9	48 34.7	1252	626	78. 2	40
41	47 43.7	1084	656	78. 7	47 34.3	1215	632	78. 0	41
42	46 43.5	1050	663	78. 4	46 34.0	1177	639	77. 7	42
43	45 43.3	1016	670	78. 2	45 33.8	1138	646	77. 5	43
44	44 43.2	982	677	78. 0	44 33.8	1101	653	77. 3	44
45	43 43.2	949	685	77. 8	43 33.8	1063	660	77. 1	45
46	42 43.3	914	692	77. 6	42 33.9	1024	668	76. 8	46
47	41 43.5	881	700	77. 4	41 34.1	987	676	76. 6	47
48	40 43.8	848	709	77. 2	40 34.5	949	685	76. 4	48
49	39 44.2	814	717	77. 0	39 34.9	911	693	76. 2	49
50	38 44.7	781	726	76. 8	38 35.5	874	702	76. 0	50
51	37 45.3	748	735	76. 6	37 36.1	837	711	75. 8	51
52	36 45.9	715	744	76. 5	36 36.8	800	721	75. 6	52
53	35 46.7	683	755	76. 3	35 37.7	764	730	75. 5	53
54	34 47.5	651	765	76. 1	34 38.6	728	741	75. 3	54
55	33 48.4	619	775	75. 9	33 39.7	693	758	75. 1	55
56	32 49.4	588	786	75. 7	32 40.8	658	762	74. 9	56
57	31 50.5	558	798	75. 6	31 42.0	624	774	74. 8	57
58	30 51.7	528	810	75. 5	30 43.3	590	785	74. 6	58
59	29 52.9	498	822	75. 3	29 44.8	557	798	74. 4	59
60	28 54.2	469	835	75. 2	28 46.3	525	811	74. 3	60
61	27 55.7	441	849	75. 0	27 47.8	493	824	74. 1	61
62	26 57.1	413	862	74. 9	26 49.5	462	838	74. 0	62
63	25 58.7	386	877	74. 8	25 51.3	432	853	73. 9	63
64	25 0.3	359	892	74. 6	24 53.1	402	868	73. 7	64
65	24 2.0	334	908	74. 5	23 55.0	373	884	73. 6	65

t° / L°	19° b	19° A	19° C	19° Z′	20° b	20° A	20° C	20° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	2433	487	90. 0	90 0.0	2701	466	90. 0	0
1	88 56.5	2432	487	89. 7	88 56.2	2701	466	89. 6	1
2	87 53.1	2430	487	89. 3	87 52.3	2698	466	89. 3	2
3	86 49.6	2426	488	89. 0	86 48.5	2693	466	88. 9	3
4	85 46.2	2420	488	88. 6	85 44.7	2688	467	88. 5	4
5	84 42.8	2413	489	88. 3	84 40.9	2679	467	88. 2	5
6	83 39.4	2405	490	87. 9	83 37.1	2669	468	87. 8	6
7	82 36.1	2395	490	87. 6	82 33.3	2659	469	87. 5	7
8	81 32.7	2383	491	87. 3	81 29.6	2646	470	87. 1	8
9	80 29.4	2370	492	86. 9	80 26.0	2631	471	86. 7	9
10	79 26.2	2355	494	86. 6	79 22.3	2615	472	86. 4	10
11	78 23.0	2339	495	86. 2	78 18.8	2597	474	86. 0	11
12	77 19.8	2322	497	85. 9	77 15.3	2577	475	85. 7	12
13	76 16.7	2303	499	85. 6	76 11.8	2556	477	85. 3	13
14	75 13.7	2283	500	85. 2	75 8.4	2534	479	85. 0	14
15	74 10.7	2261	502	84. 9	74 5.1	2510	481	84. 6	15
16	73 7.7	2238	504	84. 6	73 1.8	2484	483	84. 3	16
17	72 4.9	2214	506	84. 3	71 58.7	2457	485	83. 9	17
18	71 2.1	2189	509	83. 9	70 55.6	2429	488	83. 6	18
19	69 59.4	2162	511	83. 6	69 52.6	2398	490	83. 2	19
20	68 56.8	2134	514	83. 3	68 49.6	2367	493	82. 9	20
21	67 54.2	2105	517	83. 0	67 46.8	2335	496	82. 6	21
22	66 51.8	2075	520	82. 7	66 44.1	2301	499	82. 2	22
23	65 49.4	2043	523	82. 3	65 41.4	2266	502	81. 9	23
24	64 47.1	2012	526	82. 0	64 38.9	2231	505	81. 6	24
25	63 44.9	1978	530	81. 7	63 36.5	2194	508	81. 3	25
26	62 42.8	1944	534	81. 4	62 34.1	2156	512	80. 9	26
27	61 40.8	1909	537	81. 1	61 31.9	2116	516	80. 6	27
28	60 38.9	1872	541	80. 8	60 29.8	2076	520	80. 3	28
29	59 37.1	1836	545	80. 5	59 27.9	2035	524	80. 0	29
30	58 35.5	1798	550	80. 2	58 26.0	1994	528	79. 7	30
31	57 33.9	1761	554	79. 9	57 24.3	1952	533	79. 4	31
32	56 32.4	1721	559	79. 7	56 22.6	1909	537	79. 1	32
33	55 31.1	1682	564	79. 4	55 21.1	1864	542	78. 8	33
34	54 29.8	1643	569	79. 1	54 19.8	1820	547	78. 5	34
35	53 28.7	1602	574	78. 8	53 18.5	1775	552	78. 2	35
36	52 27.7	1561	579	78. 6	52 17.4	1730	558	77. 9	36
37	51 26.8	1520	585	78. 3	51 16.4	1683	563	77. 6	37
38	50 26.0	1478	591	78. 0	50 15.5	1637	569	77. 4	38
39	49 25.3	1436	597	77. 8	49 14.8	1591	575	77. 1	39
40	48 24.8	1395	603	77. 5	48 14.2	1544	581	76. 8	40
41	47 24.3	1352	609	77. 3	47 13.7	1497	588	76. 6	41
42	46 24.0	1310	616	77. 0	46 13.4	1451	595	76. 3	42
43	45 23.8	1268	623	76. 8	45 13.2	1403	602	76. 1	43
44	44 23.7	1225	630	76. 5	44 13.1	1356	609	75. 8	44
45	43 23.8	1183	638	76. 3	43 13.2	1308	616	75. 6	45
46	42 23.9	1140	645	76. 1	42 13.3	1262	624	75. 3	46
47	41 24.2	1098	653	75. 9	41 13.6	1215	632	75. 1	47
48	40 24.6	1056	662	75. 6	40 14.1	1168	640	74. 9	48
49	39 25.1	1014	670	75. 4	39 14.6	1122	649	74. 6	49
50	38 25.7	972	679	75. 2	38 15.3	1076	658	74. 4	50
51	37 26.4	931	688	75. 0	37 16.2	1030	667	74. 2	51
52	36 27.2	890	698	74. 8	36 17.1	985	676	74. 0	52
53	35 28.2	850	708	74. 6	35 18.2	940	686	73. 8	53
54	34 29.2	810	718	74. 4	34 19.3	896	697	73. 6	54
55	33 30.4	771	729	74. 2	33 20.6	852	707	73. 4	55
56	32 31.7	732	740	74. 1	32 22.1	810	718	73. 2	56
57	31 33.1	694	751	73. 9	31 23.6	767	730	73. 0	57
58	30 34.5	656	763	73. 7	30 25.2	725	742	72. 8	58
59	29 36.1	619	775	73. 6	29 27.0	685	754	72. 7	59
60	28 37.8	583	788	73. 4	28 28.9	645	767	72. 5	60
61	27 39.6	548	802	73. 2	27 30.8	605	780	72. 3	61
62	26 41.4	513	816	73. 1	26 32.9	567	794	72. 2	62
63	25 43.4	480	830	72. 9	25 35.1	530	809	72. 0	63
64	24 45.4	446	846	72. 8	24 37.4	494	824	71. 9	64
65	23 47.6	415	861	72. 7	23 39.7	458	840	71. 7	65

L° \ t°	21° b	21° A	21° C	21° Z′	22° b	22° A	22° C	22° Z′	t° \ L°
	° ′			°	° ′			°	
0	90 0.0	2985	446	90. 0	90 0.0	3283	426	90. 0	0
1	88 55.7	2984	446	89. 6	88 55.3	3282	426	89. 6	1
2	87 51.5	2981	446	89. 2	87 50.6	3279	427	89. 2	2
3	86 47.2	2976	446	88. 8	86 45.9	3273	427	88. 8	3
4	85 43.0	2969	447	88. 5	85 41.2	3266	427	88. 4	4
5	84 38.8	2961	447	88. 1	84 36.6	3256	428	88. 0	5
6	83 34.6	2950	448	87. 7	83 32.0	3245	429	87. 6	6
7	82 30.4	2938	449	87. 3	82 27.4	3231	430	87. 2	7
8	81 26.3	2923	450	86. 9	81 22.8	3214	431	86. 8	8
9	80 22.3	2907	451	86. 6	80 18.4	3196	432	86. 4	9
10	79 18.3	2889	452	86. 2	79 13.9	3176	433	86. 0	10
11	78 14.3	2869	454	85. 8	78 9.6	3154	434	85. 6	11
12	77 10.4	2847	455	85. 4	77 5.3	3130	436	85. 2	12
13	76 6.6	2823	457	85. 1	76 1.1	3104	438	84. 8	13
14	75 2.8	2798	459	84. 7	74 56.9	3077	439	84. 4	14
15	73 59.2	2771	461	84. 3	73 52.9	3047	441	84. 0	15
16	72 55.5	2743	463	84. 0	72 48.9	3016	443	83. 6	16
17	71 52.0	2713	465	83. 6	71 45.0	2982	446	83. 3	17
18	70 48.6	2681	467	83. 2	70 41.3	2947	448	82. 9	18
19	69 45.3	2649	470	82. 9	69 37.6	2911	451	82. 5	19
20	68 42.1	2614	473	82. 5	68 34.0	2873	453	82. 1	20
21	67 38.9	2578	475	82. 2	67 30.6	2833	456	81. 8	21
22	66 35.9	2541	478	81. 8	66 27.3	2792	459	81. 4	22
23	65 33.0	2502	482	81. 5	65 24.1	2749	462	81. 0	23
24	64 30.2	2462	485	81. 1	64 21.0	2704	466	80. 7	24
25	63 27.5	2421	488	80. 8	63 18.1	2660	469	80. 3	25
26	62 25.0	2379	492	80. 4	62 15.2	2612	473	80. 0	26
27	61 22.5	2335	496	80. 1	61 12.6	2565	477	79. 6	27
28	60 20.2	2290	500	79. 8	60 10.0	2516	480	79. 3	28
29	59 18.0	2246	504	79. 5	59 7.6	2466	484	78. 9	29
30	58 16.0	2199	508	79. 1	58 5.4	2414	488	78. 6	30
31	57 14.1	2153	512	78. 8	57 3.3	2363	493	78. 2	31
32	56 12.3	2104	517	78. 5	56 1.3	2311	498	77. 9	32
33	55 10.6	2056	522	78. 2	54 59.5	2257	503	77. 6	33
34	54 9.1	2007	527	77. 9	53 57.9	2203	508	77. 3	34
35	53 7.8	1957	532	77. 6	52 56.4	2148	513	77. 0	35
36	52 6.5	1907	537	77. 3	51 55.1	2092	518	76. 6	36
37	51 5.4	1856	543	77. 0	50 53.9	2036	524	76. 3	37
38	50 4.5	1805	549	76. 7	49 52.9	1979	530	76. 0	38
39	49 3.7	1753	555	76. 4	48 52.0	1923	536	75. 7	39
40	48 3.1	1701	561	76. 1	47 51.3	1866	542	75. 4	40
41	47 2.5	1650	568	75. 9	46 50.8	1809	548	75. 2	41
42	46 2.2	1597	574	75. 6	45 50.4	1752	555	74. 9	42
43	45 2.0	1545	581	75. 3	44 50.1	1694	562	74. 6	43
44	44 1.9	1493	588	75. 1	43 50.1	1637	569	74. 3	44
45	43 2.0	1441	596	74. 8	42 50.2	1580	577	74. 1	45
46	42 2.2	1389	604	74. 6	41 50.4	1523	585	73. 8	46
47	41 2.5	1338	612	74. 3	40 50.8	1465	593	73. 5	47
48	40 3.0	1287	620	74. 1	39 51.4	1409	601	73. 3	48
49	39 3.7	1235	629	73. 8	38 52.1	1353	609	73. 0	49
50	38 4.4	1184	637	73. 6	37 53.0	1297	618	72. 8	50
51	37 5.4	1134	647	73. 4	36 54.0	1241	627	72. 6	51
52	36 6.4	1083	656	73. 2	35 55.2	1187	637	72. 3	52
53	35 7.6	1034	666	73. 0	34 56.5	1133	647	72. 1	53
54	34 8.9	986	676	72. 7	33 57.9	1080	657	71. 9	54
55	33 10.4	938	687	72. 5	32 59.6	1026	668	71. 7	55
56	32 11.9	890	698	72. 3	32 1.3	974	679	71. 5	56
57	31 13.6	844	709	72. 2	31 3.2	923	690	71. 3	57
58	30 15.5	798	721	72. 0	30 5.2	873	702	71. 1	58
59	29 17.4	752	733	71. 8	29 7.4	824	714	70. 9	59
60	28 19.5	709	746	71. 6	28 9.6	776	727	70. 7	60
61	27 21.7	666	760	71. 4	27 12.0	728	741	70. 5	61
62	26 24.0	623	774	71. 3	26 14.6	683	755	70. 4	62
63	25 26.4	583	789	71. 1	25 17.2	637	769	70. 2	63
64	24 28.9	543	804	71. 0	24 20.0	593	785	70. 0	64
65	23 31.5	504	820	70. 8	23 22.9	551	801	69. 9	65

t° / L°	23° b	23° A	23° C	23° Z′	24° b	24° A	24° C	24° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	3597	408	90. 0	90 0.0	3927	391	90. 0	0
1	88 54.8	3596	408	89. 6	88 54.3	3925	391	89. 6	1
2	87 49.6	3593	408	89. 2	87 48.7	3922	391	89. 1	2
3	86 44.5	3587	409	88. 7	86 43.0	3915	391	88. 7	3
4	85 39.3	3578	409	88. 3	85 37.4	3907	392	88. 2	4
5	84 34.2	3567	410	87. 9	84 31.8	3894	392	87. 8	5
6	83 29.2	3555	411	87. 5	83 26.2	3880	393	87. 3	6
7	82 24.1	3540	411	87. 0	82 20.7	3863	394	86. 9	7
8	81 19.2	3521	412	86. 6	81 15.2	3844	395	86. 5	8
9	80 14.2	3503	414	86. 2	80 9.9	3822	396	86. 0	9
10	79 9.4	3480	415	85. 8	79 4.5	3797	397	85. 6	10
11	78 4.6	3455	416	85. 4	77 59.3	3771	399	85. 1	11
12	76 59.9	3429	418	85. 0	76 54.1	3741	400	84. 7	12
13	75 55.2	3401	419	84. 5	75 49.0	3711	402	84. 3	13
14	74 50.7	3370	421	84. 1	74 44.1	3677	404	83. 9	14
15	73 46.2	3337	423	83. 7	73 39.2	3640	406	83. 4	15
16	72 41.9	3303	425	83. 3	72 34.4	3602	408	83. 0	16
17	71 37.6	3265	428	82. 9	71 29.8	3562	410	82. 6	17
18	70 33.5	3226	430	82. 5	70 25.3	3519	412	82. 2	18
19	69 29.5	3186	432	82. 1	69 20.9	3475	415	81. 8	19
20	68 25.6	3144	435	81. 7	68 16.6	3429	418	81. 3	20
21	67 21.8	3100	438	81. 4	67 12.5	3381	421	80. 9	21
22	66 18.1	3055	441	81. 0	66 8.5	3332	424	80. 5	22
23	65 14.6	3008	444	80. 6	65 4.7	3279	427	80. 1	23
24	64 11.3	2960	447	80. 2	64 1.0	3226	430	79. 7	24
25	63 8.1	2910	451	79. 8	62 57.5	3171	433	79. 3	25
26	62 5.0	2858	454	79. 5	61 54.2	3115	437	79. 0	26
27	61 2.1	2806	458	79. 1	60 51.0	3057	441	78. 6	27
28	59 59.3	2752	462	78. 7	59 48.0	2999	445	78. 2	28
29	58 56.7	2697	466	78. 4	58 45.1	2938	449	77. 8	29
30	57 54.2	2640	471	78. 0	57 42.5	2876	453	77. 5	30
31	56 51.9	2583	475	77. 7	56 40.0	2814	458	77. 1	31
32	55 49.8	2525	480	77. 3	55 37.7	2751	462	76. 7	32
33	54 47.8	2467	485	77. 0	54 35.5	2686	467	76. 4	33
34	53 46.1	2407	490	76. 6	53 33.6	2621	472	76. 0	34
35	52 44.4	2347	495	76. 3	52 31.8	2555	477	75. 7	35
36	51 43.0	2286	500	76. 0	51 30.3	2488	483	75. 3	36
37	50 41.7	2225	506	75. 7	50 28.9	2421	488	75. 0	37
38	49 40.6	2163	512	75. 4	49 27.7	2354	494	74. 7	38
39	48 39.7	2100	518	75. 0	48 26.7	2286	500	74. 3	39
40	47 38.9	2038	524	74. 7	47 25.9	2217	506	74. 0	40
41	46 38.3	1975	530	74. 4	46 25.3	2149	513	73. 7	41
42	45 37.9	1913	537	74. 1	45 24.9	2080	520	73. 4	42
43	44 37.7	1850	544	73. 9	44 24.7	2012	527	73. 1	43
44	43 37.7	1786	551	73. 6	43 24.6	1943	534	72. 8	44
45	42 37.8	1724	559	73. 3	42 24.8	1874	541	72. 5	45
46	41 38.1	1661	566	73. 0	41 25.1	1807	549	72. 2	46
47	40 38.5	1599	574	72. 8	40 25.7	1739	557	72. 0	47
48	39 39.2	1537	583	72. 5	39 26.4	1671	565	71. 7	48
49	38 40.0	1476	591	72. 2	38 27.3	1604	574	71. 4	49
50	37 40.9	1415	600	72. 0	37 28.3	1537	583	71. 2	50
51	36 42.1	1354	609	71. 7	36 29.6	1472	592	70. 9	51
52	35 43.4	1295	619	71. 5	35 31.0	1406	601	70. 7	52
53	34 44.8	1235	629	71. 3	34 32.6	1341	611	70. 4	53
54	33 46.4	1177	639	71. 0	33 34.4	1278	621	70. 2	54
55	32 48.2	1119	650	70. 8	32 36.4	1216	632	70. 0	55
56	31 50.1	1063	661	70. 6	31 38.5	1153	643	69. 7	56
57	30 52.2	1007	672	70. 4	30 40.7	1093	655	69. 5	57
58	29 54.4	952	684	70. 2	29 43.2	1033	666	69. 3	58
59	28 56.8	898	696	70. 0	28 45.8	974	679	69. 1	59
60	27 59.3	845	709	69. 8	27 48.5	917	692	68. 9	60
61	27 2.0	793	723	69. 6	26 51.4	861	705	68. 7	61
62	26 4.7	743	737	69. 5	25 54.5	806	719	68. 5	62
63	25 7.7	694	751	69. 3	24 57.6	753	734	68. 4	63
64	24 10.7	647	766	69. 1	24 1.0	702	749	68. 2	64
65	23 13.9	601	782	69. 0	23 4.4	651	765	68. 0	65

t° / L°	25° b	25° A	25° C	25° Z′	26° b	26° A	26° C	26° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	4272	374	90. 0	90 0.0	4634	358	90. 0	0
1	88 53.8	4271	374	89. 5	88 53.2	4632	358	89. 5	1
2	87 47.6	4267	374	89. 1	87 46.5	4628	358	89. 0	2
3	86 41.4	4260	375	88. 6	86 39.8	4620	359	88. 5	3
4	85 35.3	4250	375	88. 1	85 33.1	4608	359	88. 1	4
5	84 29.2	4236	376	87. 7	84 26.4	4595	360	87. 6	5
6	83 23.1	4221	376	87. 2	83 19.8	4578	361	87. 1	6
7	82 17.1	4203	377	86. 7	82 13.3	4557	361	86. 6	7
8	81 11.1	4181	378	86. 3	81 6.8	4534	362	86. 1	8
9	80 5.2	4158	379	85. 8	80 0.4	4508	363	85. 6	9
10	78 59.4	4131	381	85. 4	78 54.0	4479	365	85. 2	10
11	77 53.7	4101	382	84. 9	77 47.8	4447	366	84. 7	11
12	76 48.1	4069	384	84. 5	76 41.7	4412	368	84. 2	12
13	75 42.5	4035	385	84. 0	75 35.7	4374	369	83. 7	13
14	74 37.1	3998	387	83. 6	74 29.8	4334	371	83. 3	14
15	73 31.8	3958	389	83. 1	73 24.0	4291	373	82. 8	15
16	72 26.6	3917	391	82. 7	72 18.3	4245	375	82. 3	16
17	71 21.5	3873	393	82. 2	71 12.8	4197	378	81. 9	17
18	70 16.6	3826	396	81. 8	70 7.5	4146	380	81. 4	18
19	69 11.8	3778	398	81. 4	69 2.3	4093	382	81. 0	19
20	68 7.2	3727	401	80. 9	67 57.3	4038	385	80. 5	20
21	67 2.7	3675	404	80. 5	66 52.4	3981	388	80. 1	21
22	65 58.4	3620	407	80. 1	65 47.7	3921	391	79. 6	22
23	64 54.2	3563	410	79. 7	64 43.2	3859	394	79. 2	23
24	63 50.2	3505	413	79. 3	63 38.9	3796	397	78. 8	24
25	62 46.4	3446	417	78. 9	62 34.7	3730	401	78. 4	25
26	61 42.8	3384	420	78. 4	61 30.8	3663	404	77. 9	26
27	60 39.3	3320	424	78. 0	60 27.1	3595	408	77. 5	27
28	59 36.1	3256	428	77. 7	59 23.5	3525	412	77. 1	28
29	58 33.0	3190	432	77. 3	58 20.2	3453	416	76. 7	29
30	57 30.1	3122	437	76. 9	57 17.1	3380	421	76. 3	30
31	56 27.4	3054	441	76. 5	56 14.2	3306	425	75. 9	31
32	55 24.9	2985	446	76. 1	55 11.5	3230	430	75. 5	32
33	54 22.6	2915	450	75. 8	54 9.0	3153	434	75. 1	33
34	53 20.5	2844	455	75. 4	53 6.8	3076	440	74. 7	34
35	52 18.6	2772	461	75. 0	52 4.8	2998	445	74. 4	35
36	51 17.0	2700	466	74. 7	51 3.0	2918	450	74. 0	36
37	50 15.5	2626	472	74. 3	50 1.4	2840	456	73. 6	37
38	49 14.2	2553	478	74. 0	49 0.1	2759	462	73. 3	38
39	48 13.2	2479	484	73. 6	47 58.9	2678	468	72. 9	39
40	47 12.5	2405	490	73. 3	46 58.0	2598	474	72. 6	40
41	46 11.7	2330	496	73. 0	45 57.4	2517	480	72. 3	41
42	45 11.2	2255	503	72. 7	44 56.9	2436	487	71. 9	42
43	44 11.0	2180	510	72. 4	43 56.7	2355	494	71. 6	43
44	43 11.0	2106	517	72. 1	42 56.7	2275	501	71. 3	44
45	42 11.2	2031	525	71. 8	41 56.9	2194	509	71. 0	45
46	41 11.6	1957	532	71. 5	40 57.4	2113	516	70. 7	46
47	40 12.2	1883	540	71. 2	39 58.1	2033	524	70. 4	47
48	39 13.0	1811	548	70. 9	38 58.9	1954	533	70. 1	48
49	38 14.0	1737	557	70. 6	38 0.1	1874	541	69. 8	49
50	37 15.1	1665	566	70. 3	37 1.4	1796	550	69. 5	50
51	36 16.5	1592	575	70. 1	36 2.9	1719	559	69. 2	51
52	35 18.1	1522	585	69. 8	35 4.6	1643	569	69. 0	52
53	34 19.9	1452	595	69. 6	34 6.6	1567	579	68. 7	53
54	33 21.8	1383	605	69. 3	33 8.7	1492	589	68. 5	54
55	32 24.0	1315	615	69. 1	32 11.0	1419	600	68. 2	55
56	31 26.3	1248	626	68. 9	31 13.6	1345	611	68. 0	56
57	30 28.8	1182	638	68. 6	30 16.3	1274	622	67. 8	57
58	29 31.4	1117	650	68. 4	29 19.2	1205	634	67. 5	58
59	28 34.3	1054	662	68. 2	28 22.3	1136	646	67. 3	59
60	27 37.3	992	675	68. 0	27 25.5	1069	659	67. 1	60
61	26 40.4	931	688	67. 8	26 29.0	1004	673	66. 9	61
62	25 43.7	872	702	67. 6	25 32.6	940	687	66. 7	62
63	24 47.2	815	717	67. 4	24 36.3	878	701	66. 5	63
64	23 50.8	758	732	67. 3	23 40.3	817	716	66. 3	64
65	22 54.6	704	748	67. 1	22 44.4	758	732	66. 2	65

t° / L°	27° b	27° A	27° C	27° Z′	28° b	28° A	28° C	28° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	5012	343	90. 0	90 0.0	5407	328	90. 0	0
1	88 52.7	5009	343	89. 5	88 52.0	5405	328	89. 5	1
2	87 45.3	5005	343	89. 0	87 44.1	5399	329	88. 9	2
3	86 38.0	4997	344	88. 5	86 36.2	5389	329	88. 4	3
4	85 30.8	4984	344	88. 0	85 28.3	5376	329	87. 9	4
5	84 23.5	4969	345	87. 5	84 20.5	5360	330	87. 3	5
6	83 16.3	4951	345	87. 0	83 12.7	5340	331	86. 8	6
7	82 9.2	4929	346	86. 4	82 5.0	5316	332	86. 3	7
8	81 2.2	4903	347	85. 9	80 57.4	5287	333	85. 8	8
9	79 55.2	4874	348	85. 4	79 49.8	5256	334	85. 2	9
10	78 48.4	4843	350	84. 9	78 42.4	5222	335	84. 7	10
11	77 41.6	4808	351	84. 4	77 35.1	5184	336	84. 2	11
12	76 34.9	4769	353	84. 0	76 27.9	5143	338	83. 7	12
13	75 28.4	4729	354	83. 5	75 20.8	5098	340	83. 2	13
14	74 22.0	4684	356	83. 0	74 13.9	5050	341	82. 7	14
15	73 15.8	4638	358	82. 5	73 7.1	4999	343	82. 2	15
16	72 9.6	4588	360	82. 0	72 0.5	4945	345	81. 7	16
17	71 3.7	4535	362	81. 5	70 54.1	4888	348	81. 2	17
18	69 57.9	4480	365	81. 1	69 47.8	4828	350	80. 7	18
19	68 52.3	4422	367	80. 6	68 41.7	4765	353	80. 2	19
20	67 46.8	4362	370	80. 1	67 35.8	4700	355	79. 7	20
21	66 41.6	4300	373	79. 7	66 30.2	4632	358	79. 2	21
22	65 36.5	4234	376	79. 2	65 24.7	4561	361	78. 7	22
23	64 31.6	4168	379	78. 7	64 19.5	4488	364	78. 3	23
24	63 26.9	4099	382	78. 3	63 14.4	4414	368	77. 8	24
25	62 22.5	4028	386	77. 8	62 9.6	4337	371	77. 3	25
26	61 18.2	3955	389	77. 4	61 5.0	4258	375	76. 9	26
27	60 14.2	3880	393	77. 0	60 0.7	4176	379	76. 4	27
28	59 10.4	3804	397	76. 5	58 56.6	4094	382	76. 0	28
29	58 6.8	3726	401	76. 1	57 52.8	4009	387	75. 5	29
30	57 3.5	3647	405	75. 7	56 49.2	3923	391	75. 1	30
31	56 0.3	3566	410	75. 3	55 45.8	3836	395	74. 7	31
32	54 57.5	3483	415	74. 9	54 42.8	3748	400	74. 3	32
33	53 54.8	3401	419	74. 5	53 39.9	3658	405	73. 9	33
34	52 52.4	3317	424	74. 1	52 37.4	3567	410	73. 4	34
35	51 50.3	3232	430	73. 7	51 35.1	3475	415	73. 0	35
36	50 48.3	3146	435	73. 3	50 33.0	3383	420	72. 6	36
37	49 46.7	3060	441	73. 0	49 31.3	3290	426	72. 3	37
38	48 45.2	2973	446	72. 6	48 29.7	3195	432	71. 9	38
39	47 44.0	2887	452	72. 2	47 28.5	3101	438	71. 5	39
40	46 43.1	2799	459	71. 9	46 27.5	3007	444	71. 1	40
41	45 42.4	2712	465	71. 5	45 26.8	2913	451	70. 8	41
42	44 42.0	2624	472	71. 2	44 26.4	2818	457	70. 4	42
43	43 41.8	2536	479	70. 8	43 26.2	2724	464	70. 1	43
44	42 41.8	2449	486	70. 5	42 26.2	2629	471	69. 7	44
45	41 42.1	2362	493	70. 2	41 26.6	2535	479	69. 4	45
46	40 42.6	2275	501	69. 9	40 27.2	2442	487	69. 1	46
47	39 43.3	2189	509	69. 6	39 28.0	2349	495	68. 8	47
48	38 44.3	2102	517	69. 3	38 29.1	2256	503	68. 4	48
49	37 45.6	2017	526	69. 0	37 30.4	2164	511	68. 1	49
50	36 47.0	1933	535	68. 7	36 32.0	2073	520	67. 8	50
51	35 48.7	1849	544	68. 4	35 33.9	1983	530	67. 5	51
52	34 50.6	1766	554	68. 1	34 36.0	1894	539	67. 3	52
53	33 52.7	1684	563	67. 9	33 38.3	1807	549	67. 0	53
54	32 55.0	1604	574	67. 6	32 40.8	1719	559	66. 7	54
55	31 57.6	1525	584	67. 3	31 43.6	1635	570	66. 5	55
56	31 0.3	1446	595	67. 1	30 46.6	1551	581	66. 2	56
57	30 3.3	1370	607	66. 9	29 49.8	1468	592	66. 0	57
58	29 6.4	1295	619	66. 6	28 53.2	1387	604	65. 7	58
59	28 9.8	1221	631	66. 4	27 56.8	1308	617	65. 5	59
60	27 13.3	1149	644	66. 2	27 0.7	1231	629	65. 3	60
61	26 17.1	1079	657	66. 0	26 4.7	1155	642	65. 1	61
62	25 21.0	1010	671	65. 8	25 8.9	1081	657	64. 9	62
63	24 25.1	943	686	65. 6	24 13.3	1010	671	64. 7	63
64	23 29.3	878	701	65. 4	23 17.9	940	687	64. 5	64
65	22 33.7	815	717	65. 2	22 22.7	872	702	64. 3	65

t° / L°	29° b	29° A	29° C	29° Z′	30° b	30° A	30° C	30° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	5818	314	90. 0	90 0.0	6247	301	90. 0	0
1	88 51.4	5816	314	89. 4	88 50.7	6245	301	89. 4	1
2	87 42.8	5809	315	88. 9	87 41.5	6238	301	88. 8	2
3	86 34.3	5800	315	88. 3	86 32.2	6227	302	88. 3	3
4	85 25.7	5786	315	87. 8	85 23.0	6212	302	87. 7	4
5	84 17.3	5767	316	87. 2	84 13.9	6193	303	87. 1	5
6	83 8.9	5745	317	86. 7	83 4.8	6168	303	86. 5	6
7	82 0.5	5719	318	86. 1	81 55.8	6139	304	86. 0	7
8	80 52.3	5689	319	85. 6	80 46.9	6107	305	85. 4	8
9	79 44.1	5655	320	85. 0	79 38.2	6070	306	84. 8	9
10	78 36.1	5618	321	84. 5	78 29.5	6029	308	84. 3	10
11	77 28.2	5577	322	84. 0	77 21.0	5984	309	83. 7	11
12	76 20.4	5531	324	83. 4	76 12.6	5937	311	83. 2	12
13	75 12.8	5483	326	82. 9	75 4.4	5883	312	82. 6	13
14	74 5.3	5431	327	82. 4	73 56.3	5827	314	82. 0	14
15	72 58.0	5376	329	81. 8	72 48.5	5767	316	81. 5	15
16	71 50.9	5317	331	81. 3	71 40.8	5704	318	81. 0	16
17	70 43.9	5255	334	80. 8	70 33.3	5637	320	80. 4	17
18	69 37.2	5190	336	80. 3	69 26.1	5566	323	79. 9	18
19	68 30.7	5122	339	79. 8	68 19.0	5492	325	79. 4	19
20	67 24.3	5052	341	79. 3	67 12.2	5416	328	78. 8	20
21	66 18.2	4977	344	78. 8	66 5.7	5337	331	78. 3	21
22	65 12.3	4901	347	78. 3	64 59.4	5254	334	77. 8	22
23	64 6.7	4823	350	77. 8	63 53.3	5169	337	77. 3	23
24	63 1.3	4741	354	77. 3	62 47.5	5082	340	76. 8	24
25	61 56.1	4658	357	76. 8	61 42.0	4991	344	76. 3	25
26	60 51.2	4573	361	76. 3	60 36.7	4899	347	75. 8	26
27	59 46.6	4485	364	75. 9	59 31.8	4804	351	75. 3	27
28	58 42.2	4395	368	75. 4	58 27.1	4708	355	74. 8	28
29	57 38.1	4304	373	75. 0	57 22.7	4608	359	74. 3	29
30	56 34.2	4211	377	74. 5	56 18.6	4509	364	73. 9	30
31	55 30.7	4117	381	74. 1	55 14.8	4407	368	73. 4	31
32	54 27.4	4021	386	73. 6	54 11.3	4304	373	73. 0	32
33	53 24.4	3924	391	73. 2	53 8.1	4199	377	72. 5	33
34	52 21.6	3826	396	72. 8	52 5.2	4094	382	72. 1	34
35	51 19.2	3727	401	72. 4	51 2.6	3987	388	71. 7	35
36	50 17.0	3627	406	72. 0	50 0.3	3880	393	71. 3	36
37	49 15.2	3527	412	71. 6	48 58.3	3772	399	70. 8	37
38	48 13.6	3426	418	71. 2	47 56.7	3663	405	70. 4	38
39	47 12.3	3324	424	70. 8	46 55.3	3554	411	70. 0	39
40	46 11.2	3222	430	70. 4	45 54.3	3446	417	69. 6	40
41	45 10.5	3120	437	70. 0	44 53.5	3336	423	69. 3	41
42	44 10.1	3019	443	69. 7	43 53.1	3226	430	68. 9	42
43	43 9.9	2917	450	69. 3	42 53.0	3117	437	68. 5	43
44	42 10.0	2816	457	68. 9	41 53.1	3008	444	68. 1	44
45	41 10.4	2715	465	68. 6	40 53.6	2899	452	67. 8	45
46	40 11.1	2614	473	63. 3	39 54.4	2792	459	67. 4	46
47	39 12.0	2514	480	67. 9	38 55.4	2684	467	67. 1	47
48	38 13.2	2414	489	67. 6	37 56.8	2578	475	66. 8	48
49	37 14.7	2316	497	67. 3	36 58.4	2472	484	66. 5	49
50	36 16.5	2218	506	67. 0	36 0.3	2367	493	66. 1	50
51	35 18.5	2122	516	66. 7	35 2.5	2264	502	65. 8	51
52	34 20.7	2026	525	66. 4	34 5.0	2162	512	65. 5	52
53	33 23.3	1932	535	66. 1	33 7.7	2061	522	65. 2	53
54	32 26.0	1839	545	65. 8	32 10.7	1962	532	65. 0	54
55	31 29.0	1748	556	65. 6	31 14.0	1863	542	64. 7	55
56	30 32.3	1658	567	65. 3	30 17.5	1768	553	64. 4	56
57	29 35.8	1569	578	65. 1	29 21.2	1673	565	64. 2	57
58	28 39.5	1483	590	64. 8	28 25.2	1581	577	63. 9	58
59	27 43.4	1398	602	64. 6	27 29.3	1490	589	63. 7	59
60	26 47.5	1315	615	64. 4	26 33.9	1401	602	63. 4	60
61	25 51.9	1234	629	64. 1	25 38.6	1315	615	63. 2	61
62	24 56.4	1155	643	63. 9	24 43.5	1231	629	63. 0	62
63	24 1.2	1079	657	63. 7	23 48.6	1149	644	62. 8	63
64	23 6.1	1004	673	63. 5	22 53.9	1069	659	62. 6	64
65	22 11.3	931	688	63. 3	21 59.4	992	675	62. 4	65

L° \ t°	31° b	31° A	31° C	31° Z′	32° b	32° A	32° C	32° Z′	L° \ t°
	° ′			°	° ′			°	
0	90 0.0	6693	288	90. 0	90 0.0	7158	276	90. 0	0
1	88 50.0	6691	288	89. 4	88 49.3	7155	276	89. 4	1
2	87 40.0	6683	288	88. 8	87 38.5	7147	276	88. 8	2
3	86 30.1	6672	289	88. 2	86 27.8	7135	276	88. 1	3
4	85 20.2	6656	289	87. 6	85 17.2	7117	277	87. 5	4
5	84 10.3	6634	290	87. 0	84 6.6	7093	277	86. 9	5
6	83 0.6	6608	291	86. 4	82 56.1	7066	278	86. 3	6
7	81 50.9	6577	291	85. 8	81 45.7	7032	279	85. 6	7
8	80 41.3	6542	292	85. 2	80 35.4	6994	280	85. 0	8
9	79 31.9	6502	294	84. 6	79 25.3	6952	281	84. 4	9
10	78 22.6	6458	295	84. 0	78 15.3	6904	282	83. 8	10
11	77 13.4	6410	296	83. 5	77 5.4	6851	284	83. 2	11
12	76 4.4	6357	298	82. 9	75 55.7	6795	285	82. 6	12
13	74 55.6	6300	299	82. 3	74 46.3	6733	287	82. 0	13
14	73 46.9	6240	301	81. 7	73 37.0	6667	289	81. 4	14
15	72 38.5	6174	303	81. 2	72 27.9	6597	291	80. 8	15
16	71 30.2	6106	305	80. 6	71 19.1	6523	293	80. 2	16
17	70 22.2	6033	308	80. 0	70 10.5	6445	295	79. 6	17
18	69 14.4	5958	310	79. 5	69 2.2	6363	298	79. 1	18
19	68 6.9	5878	313	78. 9	67 54.1	6277	300	78. 5	19
20	66 59.6	5795	315	78. 4	66 46.3	6188	303	77. 9	20
21	65 52.6	5710	318	77. 8	65 38.8	6096	306	77. 4	21
22	64 45.8	5620	321	77. 3	64 31.6	6000	309	76. 8	22
23	63 39.3	5528	324	76. 8	63 24.6	5900	312	76. 3	23
24	62 33.1	5433	327	76. 3	62 18.0	5798	315	75. 7	24
25	61 27.2	5336	331	75. 8	61 11.7	5694	319	75. 2	25
26	60 21.6	5236	335	75. 2	60 5.7	5587	322	74. 7	26
27	59 16.3	5135	338	74. 7	59 0.1	5477	326	74. 2	27
28	58 11.3	5031	342	74. 2	57 54.8	5365	330	73. 7	28
29	57 6.6	4925	346	73. 8	56 49.8	5252	334	73. 1	29
30	56 2.3	4818	351	73. 3	55 45.2	5136	338	72. 7	30
31	54 58.2	4708	355	72. 8	54 40.9	5018	343	72. 2	31
32	53 54.5	4596	360	72. 3	53 37.0	4899	347	71. 7	32
33	52 51.1	4484	365	71. 9	52 33.4	4778	352	71. 2	33
34	51 48.0	4371	370	71. 4	51 30.1	4656	357	70. 7	34
35	50 45.3	4257	375	71. 0	50 27.3	4534	362	70. 3	35
36	49 42.9	4141	380	70. 5	49 24.8	4410	368	69. 8	36
37	48 40.8	4025	386	70. 1	48 22.6	4286	373	69. 4	37
38	47 39.1	3909	392	69. 7	47 20.8	4161	379	69. 0	38
39	46 37.7	3792	398	69. 3	46 19.3	4036	385	68. 5	39
40	45 36.7	3674	404	68. 9	45 18.2	3910	392	68. 1	40
41	44 35.9	3557	410	68. 5	44 17.5	3784	398	67. 7	41
42	43 35.5	3439	417	68. 1	43 17.1	3660	405	67. 3	42
43	42 35.4	3323	424	67. 7	42 17.0	3534	412	66. 9	43
44	41 35.6	3205	431	67. 3	41 17.3	3410	419	66. 5	44
45	40 36.1	3090	439	67. 0	40 18.0	3285	426	66. 2	45
46	39 37.0	2974	446	66. 6	39 18.9	3162	434	65. 8	46
47	38 38.2	2859	454	66. 3	38 20.3	3039	442	65. 4	47
48	37 39.7	2745	463	65. 9	37 21.9	2917	450	65. 1	48
49	36 41.5	2632	471	65. 6	36 23.9	2797	459	64. 8	49
50	35 43.5	2521	480	65. 3	35 26.1	2678	468	64. 4	50
51	34 45.9	2410	489	65. 0	34 28.7	2560	477	64. 1	51
52	33 48.6	2301	499	64. 7	33 31.6	2444	486	63. 8	52
53	32 51.6	2194	509	64. 4	32 34.8	2329	496	63. 5	53
54	31 54.8	2087	519	64. 1	31 38.3	2216	507	63. 2	54
55	30 58.3	1983	530	63. 8	30 42.1	2105	517	62. 9	55
56	30 2.1	1880	541	63. 5	29 46.2	1996	528	62. 6	56
57	29 6.2	1779	552	63. 3	28 50.6	1889	540	62. 3	57
58	28 10.5	1681	564	63. 0	27 55.2	1784	552	62. 1	58
59	27 15.0	1585	576	62. 8	27 0.1	1681	564	61. 8	59
60	26 19.9	1490	589	62. 5	26 5.2	1581	577	61. 6	60
61	25 24.9	1398	603	62. 3	25 10.6	1483	590	61. 3	61
62	24 30.1	1308	617	62. 1	24 16.3	1387	604	61. 1	62
63	23 35.6	1221	631	61. 8	23 22.2	1295	619	60. 9	63
64	22 41.2	1136	646	61. 6	22 28.3	1205	634	60. 7	64
65	21 47.2	1054	662	61. 4	21 34.6	1117	650	60. 5	65

t° / L°	33° b	33° A	33° C	33° Z′	34° b	34° A	34° C	34° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	7641	264	90. 0	90 0.0	8143	252	90. 0	0
1	88 48.5	7639	264	89. 4	88 47.6	8139	252	89. 3	1
2	87 36.9	7629	264	88. 7	87 35.3	8130	253	88. 7	2
3	86 25.5	7615	264	88. 1	86 23.0	8116	253	88. 0	3
4	85 14.0	7597	265	87. 4	85 10.7	8095	253	87. 3	4
5	84 2.7	7571	266	86. 8	83 58.6	8068	254	86. 6	5
6	82 51.4	7541	266	86. 1	82 46.5	8035	255	86. 0	6
7	81 40.3	7505	267	85. 5	81 34.5	7996	256	85. 3	7
8	80 29.2	7464	268	84. 8	80 22.7	7952	257	84. 6	8
9	79 18.3	7418	269	84. 2	79 11.1	7902	258	84. 0	9
10	78 7.6	7367	271	83. 6	77 59.6	7847	259	83. 3	10
11	76 57.1	7310	272	82. 9	76 48.3	7786	260	82. 7	11
12	75 46.7	7248	273	82. 3	75 37.2	7720	262	82. 0	12
13	74 36.5	7183	275	81. 7	74 26.3	7649	264	81. 4	13
14	73 26.6	7112	277	81. 1	73 15.7	7572	265	80. 7	14
15	72 16.9	7036	279	80. 5	72 5.3	7491	267	80. 1	15
16	71 7.5	6956	281	79. 9	70 55.2	7404	270	79. 5	16
17	69 58.3	6871	283	79. 3	69 45.4	7315	272	78. 8	17
18	68 49.4	6783	286	78. 7	68 35.9	7219	274	78. 2	18
19	67 40.7	6691	288	78. 1	67 26.7	7121	277	77. 6	19
20	66 32.4	6595	291	77. 5	66 17.8	7017	279	77. 0	20
21	65 24.4	6495	294	76. 9	65 9.3	6910	282	76. 4	21
22	64 16.7	6392	297	76. 3	64 1.1	6799	285	75. 8	22
23	63 9.3	6285	300	75. 8	62 53.2	6684	288	75. 2	23
24	62 2.2	6176	303	75. 2	61 45.7	6566	292	74. 7	24
25	60 55.5	6064	307	74. 7	60 38.6	6447	295	74. 1	25
26	59 49.2	5949	310	74. 1	59 31.9	6322	299	73. 5	26
27	58 43.2	5831	314	73. 6	58 25.5	6196	303	73. 0	27
28	57 37.5	5712	318	73. 0	57 19.5	6067	307	72. 6	28
29	56 32.3	5588	322	72. 5	56 14.0	5937	311	71. 9	29
30	55 27.4	5465	326	72. 0	55 8.8	5803	315	71. 4	30
31	54 22.8	5338	331	71. 5	54 4.0	5668	319	70. 8	31
32	53 18.7	5210	335	71. 0	52 59.6	5531	324	70. 3	32
33	52 14.9	5082	340	70. 5	51 55.6	5394	329	69. 8	33
34	51 11.5	4951	345	70. 0	50 52.1	5254	334	69. 3	34
35	50 8.5	4820	351	69. 6	49 48.9	5114	339	68. 9	35
36	49 5.9	4687	356	69. 1	48 46.2	4973	344	68. 4	36
37	48 3.6	4554	362	68. 7	47 43.8	4830	350	67. 9	37
38	47 1.7	4420	367	68. 2	46 41.9	4687	356	67. 4	38
39	46 0.2	4287	373	67. 8	45 40.4	4545	362	67. 0	39
40	44 59.1	4153	380	67. 3	44 39.3	4402	368	66. 6	40
41	43 58.4	4019	386	66. 9	43 38.5	4260	375	66. 1	41
42	42 58.0	3885	393	66. 5	42 38.2	4117	381	65. 7	42
43	41 58.0	3751	400	66. 1	41 38.3	3974	388	65. 3	43
44	40 58.4	3618	407	65. 7	40 38.8	3833	396	64. 9	44
45	39 59.1	3487	414	65. 3	39 39.6	3692	403	64. 5	45
46	39 0.2	3354	422	65. 0	38 40.8	3552	411	64. 1	46
47	38 1.7	3223	430	64. 6	37 42.4	3413	419	63. 7	47
48	37 3.5	3095	438	64. 2	36 44.4	3275	427	63. 4	48
49	36 5.6	2965	447	63. 9	35 46.8	3138	436	63. 0	49
50	35 8.1	2840	456	63. 6	34 49.5	3004	444	62. 7	50
51	34 10.9	2714	465	63. 2	33 52.5	2871	454	62. 3	51
52	33 14.1	2590	475	62. 9	32 55.9	2739	463	62. 0	52
53	32 17.5	2468	484	62. 6	31 59.6	2610	473	61. 7	53
54	31 21.3	2348	495	62. 3	31 3.7	2482	483	61. 4	54
55	30 25.4	2230	505	62. 0	30 8.1	2357	494	61. 1	55
56	29 29.8	2114	516	61. 7	29 12.8	2234	505	60. 8	56
57	28 34.5	2000	528	61. 4	28 17.8	2114	516	60. 5	57
58	27 39.4	1889	540	61. 2	27 23.2	1996	528	60. 2	58
59	26 44.7	1779	552	60. 9	26 28.8	1880	541	60. 0	59
60	25 50.2	1673	565	60. 6	25 34.7	1768	553	59. 7	60
61	24 56.0	1569	578	60. 4	24 40.8	1658	567	59. 5	61
62	24 2.0	1468	592	60. 2	23 47.3	1551	581	59. 2	62
63	23 8.3	1370	607	59. 9	22 54.0	1446	595	59. 0	63
64	22 14.8	1274	622	59. 7	22 1.0	1345	611	58. 8	64
65	21 21.6	1182	638	59. 5	21 8.2	1248	626	58. 6	65

t° / L°	35° b	35° A	35° C	35° Z′	36° b	36° A	36° C	36° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	8664	241	90. 0	90 0.0	9204	231	90. 0	0
1	88 46.8	8660	241	89. 3	88 45.8	9200	231	89. 3	1
2	87 33.5	8650	242	88. 6	87 31.7	9191	231	88. 5	2
3	86 20.4	8634	242	87. 9	86 17.6	9173	231	87. 8	3
4	85 7.2	8612	242	87. 2	85 3.6	9148	232	87. 1	4
5	83 54.2	8582	243	86. 5	83 49.7	9118	232	86. 4	5
6	82 41.3	8547	244	85. 8	82 35.9	9079	233	85. 7	6
7	81 28.5	8506	245	85. 1	81 22.2	9035	234	84. 9	7
8	80 15.9	8458	246	84. 4	80 8.7	8984	235	84. 2	8
9	79 3.4	8405	247	83. 7	78 55.4	8925	236	83. 5	9
10	77 51.1	8345	248	83. 1	77 42.3	8861	237	82. 8	10
11	76 39.1	8280	249	82. 4	76 29.4	8791	239	82. 1	11
12	75 27.2	8208	251	81. 7	75 16.7	8714	240	81. 4	12
13	74 15.6	8132	253	81. 0	74 4.4	8631	242	80. 7	13
14	73 4.3	8049	255	80. 4	72 52.3	8543	244	80. 0	14
15	71 55.2	7961	256	79. 7	71 40.5	8449	246	79. 4	15
16	70 42.4	7870	259	79. 1	70 29.0	8351	248	78. 7	16
17	69 32.0	7773	261	78. 4	69 17.9	8246	250	78. 0	17
18	68 21.8	7670	263	77. 8	68 7.1	8137	253	77. 3	18
19	67 12.0	7563	266	77. 2	66 56.7	8022	255	76. 7	19
20	66 2.6	7452	268	76. 5	65 46.6	7904	258	76. 0	20
21	64 53.5	7338	271	75. 9	64 37.0	7781	261	75. 4	21
22	63 44.8	7219	274	75. 3	63 27.7	7652	264	74. 8	22
23	62 36.4	7096	277	74. 7	62 18.9	7520	267	74. 2	23
24	61 28.5	6970	281	74. 1	61 10.5	7387	270	73. 5	24
25	60 20.9	6841	284	73. 5	60 2.5	7247	274	72. 9	25
26	59 13.8	6709	288	72. 9	58 54.9	7106	277	72. 3	26
27	58 7.1	6574	292	72. 4	57 47.8	6961	281	71. 7	27
28	57 0.7	6435	295	71. 8	56 41.2	6814	285	71. 2	28
29	55 54.9	6295	300	71. 3	55 34.9	6664	289	70. 6	29
30	54 49.4	6153	304	70. 7	54 29.2	6513	293	70. 0	30
31	53 44.4	6008	308	70. 2	53 23.9	6358	298	69. 5	31
32	52 39.8	5862	313	69. 6	52 19.1	6202	302	68. 9	32
33	51 35.6	5715	318	69. 1	51 14.7	6046	307	68. 4	33
34	50 31.9	5566	323	68. 6	50 10.8	5887	312	67. 9	34
35	49 28.6	5416	328	68. 1	49 7.4	5727	317	67. 4	35
36	48 25.7	5266	333	67. 6	48 4.5	5566	323	66. 9	36
37	47 23.3	5114	339	67. 2	47 2.0	5405	328	66. 4	37
38	46 21.3	4963	345	66. 7	45 59.9	5244	334	65. 9	38
39	45 19.8	4810	351	66. 2	44 58.4	5082	340	65. 4	39
40	44 18.6	4658	357	65. 8	43 57.3	4920	347	65. 0	40
41	43 18.0	4506	364	65. 3	42 56.6	4759	353	64. 5	41
42	42 17.7	4354	370	64. 9	41 56.4	4597	360	64. 1	42
43	41 17.8	4203	377	64. 5	40 56.6	4437	367	63. 6	43
44	40 18.4	4053	384	64. 1	39 57.3	4277	374	63. 2	44
45	39 19.4	3902	392	63. 7	38 58.4	4118	381	62. 8	45
46	38 20.7	3753	400	63. 3	38 0.0	3960	389	62. 4	46
47	37 22.5	3607	408	62. 9	37 1.9	3804	397	62. 0	47
48	36 24.7	3460	416	62. 5	36 4.3	3649	405	61. 6	48
49	35 27.2	3316	424	62. 1	35 7.0	3496	414	61. 3	49
50	34 30.2	3172	433	61. 8	34 10.2	3345	423	60. 9	50
51	33 33.5	3032	443	61. 4	33 13.8	3195	432	60. 6	51
52	32 37.1	2892	452	61. 1	32 17.8	3047	441	60. 2	52
53	31 41.2	2755	462	60. 8	31 22.1	2903	451	59. 9	53
54	30 45.5	2620	472	60. 5	30 26.8	2760	462	59. 6	54
55	29 50.3	2487	483	60. 2	29 31.8	2620	472	59. 2	55
56	28 55.3	2357	494	59. 9	28 37.2	2482	483	58. 9	56
57	28 0.7	2230	505	59. 6	27 43.0	2348	495	58. 6	57
58	27 6.4	2105	517	59. 3	26 49.1	2216	507	58. 4	58
59	26 12.4	1983	530	59. 0	25 55.5	2087	519	58. 1	59
60	25 18.7	1863	542	58. 8	25 2.2	1962	532	57. 8	60
61	24 25.3	1748	556	58. 5	24 9.2	1839	545	57. 6	61
62	23 32.1	1635	570	58. 3	23 16.5	1719	559	57. 3	62
63	22 39.3	1525	584	58. 0	22 24.1	1604	574	57. 1	63
64	21 46.7	1419	600	57. 8	21 32.0	1492	589	56. 9	64
65	20 54.3	1315	615	57. 6	20 40.1	1383	605	56. 6	65

t° / L°	37° b	A	C	Z′	38° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	9765	221	90. 0	90 0.0	10347	211	90. 0	0
1	88 44.9	9762	221	89. 2	88 43.9	10343	211	89. 2	1
2	87 29.8	9750	221	88. 5	87 27.8	10331	211	88. 4	2
3	86 14.7	9732	221	87. 7	86 11.7	10310	211	87. 7	3
4	84 59.8	9706	222	87. 0	84 55.7	10283	212	86. 9	4
5	83 44.9	9672	222	86. 2	83 39.9	10247	212	86. 1	5
6	82 30.2	9630	223	85. 5	82 24.2	10202	213	85. 3	6
7	81 15.6	9583	224	84. 8	81 8.6	10151	214	84. 6	7
8	80 1.2	9528	225	84. 0	79 53.3	10091	215	83. 8	8
9	78 47.0	9465	226	83. 3	78 38.1	10025	216	83. 0	9
10	77 33.0	9396	227	82. 5	77 23.2	9951	217	82. 3	10
11	76 19.2	9321	229	81. 8	76 8.6	9870	219	81. 5	11
12	75 5.8	9239	230	81. 1	74 54.3	9782	220	80. 8	12
13	73 52.6	9150	232	80. 4	73 40.2	9687	222	80. 0	13
14	72 39.7	9055	234	79. 7	72 26.6	9584	224	79. 3	14
15	71 27.2	8954	236	79. 0	71 13.2	9477	226	78. 6	15
16	70 15.0	8848	238	78. 3	70 0.3	9362	228	77. 8	16
17	69 3.1	8736	240	77. 6	68 47.7	9242	230	77. 1	17
18	67 51.7	8619	242	76. 9	67 35.5	9117	232	76. 4	18
19	66 40.6	8496	245	76. 2	66 23.8	8986	235	75. 7	19
20	65 30.0	8369	248	75. 5	65 12.5	8849	238	75. 0	20
21	64 19.7	8237	250	74. 9	64 1.7	8708	241	74. 4	21
22	63 9.9	8100	253	74. 2	62 51.3	8562	243	73. 7	22
23	62 0.6	7959	257	73. 6	61 41.4	8412	247	73. 0	23
24	60 51.7	7815	260	73. 0	60 32.0	8258	250	72. 4	24
25	59 43.2	7667	263	72. 3	59 23.1	8100	253	71. 7	25
26	58 35.2	7516	267	71. 7	58 14.7	7938	257	71. 1	26
27	57 27.7	7362	271	71. 1	57 6.8	7774	261	70. 5	27
28	56 20.7	7204	275	70. 5	55 59.4	7606	265	69. 9	28
29	55 14.2	7045	279	69. 9	54 52.6	7435	269	69. 3	29
30	54 8.2	6882	283	69. 4	53 46.3	7263	273	68. 7	30
31	53 2.6	6718	287	68. 8	52 40.5	7088	278	68. 1	31
32	51 57.6	6552	292	68. 2	51 35.2	6911	282	67. 5	32
33	50 53.0	6385	297	67. 7	50 30.5	6733	287	67. 0	33
34	49 49.0	6216	302	67. 2	49 26.3	6554	292	66. 4	34
35	48 45.4	6046	307	66. 6	48 22.6	6374	297	65. 9	35
36	47 42.4	5875	313	66. 1	47 19.4	6192	303	65. 3	36
37	46 39.8	5704	318	65. 6	46 16.8	6010	308	64. 8	37
38	45 37.7	5532	324	65. 1	45 14.7	5827	314	64. 3	38
39	44 36.2	5361	330	64. 6	44 13.2	5646	320	63. 8	39
40	43 35.1	5188	336	64. 2	43 12.1	5463	326	63. 3	40
41	42 34.5	5017	343	63. 7	42 11.5	5281	333	62. 9	41
42	41 34.3	4846	349	63. 2	41 11.5	5101	340	62. 4	42
43	40 34.7	4676	356	62. 8	40 11.9	4920	347	62. 0	43
44	39 35.5	4507	364	62. 4	39 12.9	4740	354	61. 5	44
45	38 36.7	4338	371	62. 0	38 14.3	4562	361	61. 1	45
46	37 38.4	4171	379	61. 5	37 16.2	4386	369	60. 7	46
47	36 40.6	4005	387	61. 1	36 18.6	4211	377	60. 3	47
48	35 43.2	3842	395	60. 8	35 21.4	4039	385	59. 9	48
49	34 46.2	3680	404	60. 4	34 24.7	3867	394	59. 5	49
50	33 49.6	3520	412	60. 0	33 28.4	3699	403	59. 1	50
51	32 53.5	3362	422	59. 6	32 32.6	3532	412	58. 7	51
52	31 57.8	3206	431	59. 3	31 37.1	3369	421	58. 4	52
53	31 2.4	3053	441	59. 0	30 42.1	3206	431	58. 0	53
54	30 7.4	2903	451	58. 6	29 47.5	3047	441	57. 7	54
55	29 12.9	2755	462	58. 3	28 53.3	2892	452	57. 4	55
56	28 18.6	2610	473	58. 0	27 59.5	2739	463	57. 1	56
57	27 24.8	2468	484	57. 7	27 6.0	2590	475	56. 8	57
58	26 31.3	2329	496	57. 4	26 12.9	2444	486	56. 5	58
59	25 38.1	2194	509	57. 1	25 20.2	2301	499	56. 2	59
60	24 45.2	2061	522	56. 9	24 27.8	2162	512	55. 9	60
61	23 52.7	1932	535	56. 6	23 35.7	2026	525	55. 7	61
62	23 0.5	1807	549	56. 4	22 44.0	1894	539	55. 4	62
63	22 8.6	1684	563	56. 1	21 52.6	1766	554	55. 2	63
64	21 16.9	1567	579	55. 9	21 1.4	1643	569	54. 9	64
65	20 25.5	1452	595	55. 7	20 10.6	1522	585	54. 7	65

L° \ t°	39° b	39° A	39° C	39° Z′	40° b	40° A	40° C	40° Z′	L° \ t°
	° ′			°	° ′			°	
0	90 0.0	10950	201	90. 0	90 0.0	11575	192	90. 0	0
1	88 42.8	10946	201	89. 2	88 41.7	11570	192	89. 2	1
2	87 25.6	10932	201	88. 4	87 23.4	11555	192	88. 3	2
3	86 8.5	10911	202	87. 6	86 5.2	11532	193	87. 5	3
4	84 51.5	10880	202	86. 7	84 47.1	11501	193	86. 7	4
5	83 34.6	10842	203	86. 0	83 29.1	11458	194	85. 8	5
6	82 17.9	10795	203	85. 2	82 11.3	11408	194	85. 0	6
7	81 1.3	10739	204	84. 4	80 53.6	11349	195	84. 2	7
8	79 45.0	10676	205	83. 6	79 36.2	11280	196	83. 3	8
9	78 28.8	10604	206	82. 8	78 19.1	11203	197	82. 5	9
10	77 13.0	10524	208	82. 0	77 2.3	11118	199	81. 7	10
11	75 57.4	10438	209	81. 2	75 45.7	11025	200	80. 9	11
12	74 42.2	10343	211	80. 4	74 29.5	10923	202	80. 1	12
13	73 27.3	10241	212	79. 7	73 13.7	10814	203	79. 3	13
14	72 12.7	10132	214	78. 9	71 58.3	10698	205	78. 5	14
15	70 58.6	10017	216	78. 2	70 43.3	10573	207	77. 7	15
16	69 44.8	9894	218	77. 4	69 28.7	10443	209	77. 0	16
17	68 31.5	9765	221	76. 7	68 14.6	10306	211	76. 2	17
18	67 18.6	9630	223	76. 0	67 0.9	10161	214	75. 5	18
19	66 6.2	9490	225	75. 2	65 47.8	10012	216	74. 7	19
20	64 54.3	9345	228	74. 5	64 35.2	9856	219	74. 0	20
21	63 42.8	9194	231	73. 8	63 23.1	9695	222	73. 3	21
22	62 31.8	9038	234	73. 1	62 11.5	9529	225	72. 6	22
23	61 21.4	8877	237	72. 4	61 0.5	9358	228	71. 8	23
24	60 11.5	8713	240	71. 8	59 50.1	9182	231	71. 2	24
25	59 2.1	8544	244	71. 1	58 40.2	9003	235	70. 5	25
26	57 53.3	8373	247	70. 5	57 30.9	8820	238	69. 8	26
27	56 45.0	8197	251	69. 8	56 22.2	8631	242	69. 1	27
28	55 37.2	8018	255	69. 2	55 14.1	8442	246	68. 5	28
29	54 30.1	7837	259	68. 6	54 6.6	8249	250	67. 9	29
30	53 23.5	7653	264	68. 0	52 59.7	8053	254	67. 2	30
31	52 17.4	7468	268	67. 4	51 53.4	7856	259	66. 6	31
32	51 11.9	7279	273	66. 8	50 47.7	7657	264	66. 0	32
33	50 7.0	7090	278	66. 2	49 42.6	7456	268	65. 4	33
34	49 2.7	6899	283	65. 6	48 38.1	7254	273	64. 9	34
35	47 58.9	6708	288	65. 1	47 34.3	7050	279	64. 3	35
36	46 55.6	6516	293	64. 5	46 31.0	6846	284	63. 7	36
37	45 53.0	6322	299	64. 0	45 28.3	6641	290	63. 2	37
38	44 50.9	6130	305	63. 5	44 26.1	6438	295	62. 7	38
39	43 49.3	5937	311	63. 0	43 24.6	6233	301	62. 2	39
40	42 48.3	5743	317	62. 5	42 23.6	6029	308	61. 7	40
41	41 47.8	5552	323	62. 0	41 23.3	5826	314	61. 2	41
42	40 47.9	5360	330	61. 5	40 23.4	5625	321	60. 7	42
43	39 48.4	5169	337	61. 1	39 24.1	5423	328	60. 2	43
44	38 49.5	4980	344	60. 6	38 25.4	5223	335	59. 8	44
45	37 51.1	4792	352	60. 2	37 27.2	5025	342	59. 3	45
46	36 53.3	4605	359	59. 8	36 29.6	4828	350	58. 9	46
47	35 55.9	4421	367	59. 4	35 32.4	4634	358	58. 5	47
48	34 58.9	4238	376	59. 0	34 35.8	4442	366	58. 1	48
49	34 2.5	4059	384	58. 6	33 39.6	4252	375	57. 7	49
50	33 6.5	3881	393	58. 2	32 43.9	4065	384	57. 3	50
51	32 11.0	3705	402	57. 8	31 48.8	3881	393	56. 9	51
52	31 15.9	3532	412	57. 5	30 54.0	3699	403	56. 5	52
53	30 21.2	3362	422	57. 1	29 59.8	3520	412	56. 2	53
54	29 27.0	3195	432	56. 8	29 5.9	3345	423	55. 8	54
55	28 33.2	3032	443	56. 4	28 12.5	3172	433	55. 5	55
56	27 39.8	2871	454	56. 1	27 19.5	3004	444	55. 2	56
57	26 46.8	2714	465	55. 8	26 26.9	2840	456	54. 9	57
58	25 54.1	2560	477	55. 5	25 34.8	2678	468	54. 6	58
59	25 1.8	2410	489	55. 2	24 43.0	2521	480	54. 3	59
60	24 9.9	2264	502	55. 0	23 51.5	2367	493	54. 0	60
61	23 18.3	2122	516	54. 7	23 0.4	2218	506	53. 7	61
62	22 27.1	1983	530	54. 4	22 9.7	2073	520	53. 5	62
63	21 36.1	1849	544	54. 2	21 19.3	1933	535	53. 2	63
64	20 45.5	1719	559	54. 0	20 29.2	1796	550	53. 0	64
65	19 55.2	1592	575	53. 7	19 39.4	1665	566	52. 7	65

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t° / L°	41° b	41° A	41° C	41° Z′	42° b	42° A	42° C	42° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	12222	183	90. 0	90 0.0	12893	174	90. 0	0
1	88 40.5	12216	183	89. 1	88 39.3	12887	174	89. 1	1
2	87 21.0	12202	183	88. 3	87 18.6	12871	175	88. 2	2
3	86 1.7	12177	184	87. 4	85 58.0	12845	175	87. 3	3
4	84 42.4	12142	184	86. 5	84 37.5	12808	175	86. 4	4
5	83 23.3	12097	185	85. 7	83 17.1	12759	176	85. 5	5
6	82 4.3	12044	185	84. 8	81 57.0	12701	177	84. 6	6
7	80 45.6	11980	186	84. 0	80 37.1	12633	178	83. 7	7
8	79 27.1	11906	187	83. 1	79 17.5	12554	179	82. 9	8
9	78 8.9	11824	188	82. 3	77 58.1	12466	180	82. 0	9
10	76 51.0	11734	190	81. 4	76 39.1	12368	181	81. 1	10
11	75 33.4	11633	191	80. 6	75 20.5	12261	182	80. 3	11
12	74 16.2	11524	193	79. 8	74 2.3	12144	184	79. 4	12
13	72 59.5	11407	194	78. 9	72 44.5	12020	186	78. 6	13
14	71 43.1	11282	196	78. 1	71 27.2	11886	188	77. 7	14
15	70 27.2	11149	198	77. 3	70 10.4	11744	190	76. 9	15
16	69 11.8	11010	200	76. 5	68 54.0	11595	192	76. 1	16
17	67 56.8	10863	202	75. 7	67 38.3	11437	194	75. 3	17
18	66 42.4	10709	205	75. 0	66 23.0	11273	196	74. 5	18
19	65 28.5	10549	207	74. 2	65 8.4	11103	199	73. 7	19
20	64 15.2	10382	210	73. 4	63 54.3	10925	201	72. 9	20
21	63 2.5	10211	213	72. 7	62 40.9	10742	204	72. 1	21
22	61 50.3	10033	216	72. 0	61 28.1	10553	207	71. 4	22
23	60 38.7	9851	219	71. 2	60 15.9	10359	211	70. 6	23
24	59 27.7	9665	222	70. 5	59 4.4	10160	214	69. 9	24
25	58 17.4	9473	226	69. 8	57 53.6	9956	217	69. 2	25
26	57 7.6	9278	229	69. 1	56 43.4	9749	221	68. 5	26
27	55 58.5	9079	233	68. 5	55 33.8	9537	225	67. 8	27
28	54 50.1	8876	237	67. 8	54 25.0	9323	228	67. 1	28
29	53 42.2	8672	241	67. 1	53 16.9	9106	235	66. 4	29
30	52 35.0	8465	246	66. 5	52 9.4	8885	237	65. 8	30
31	51 28.5	8255	250	65. 9	51 2.6	8663	241	65. 1	31
32	50 22.6	8044	255	65. 3	49 56.5	8438	246	64. 5	32
33	49 17.3	7831	259	64. 7	48 51.1	8213	251	63. 9	33
34	48 12.7	7616	264	64. 1	47 46.3	7986	256	63. 3	34
35	47 8.7	7401	270	63. 5	46 42.2	7759	261	62. 7	35
36	46 5.4	7185	275	62. 9	45 38.8	7531	266	62. 1	36
37	45 2.6	6969	281	62. 4	44 36.1	7303	272	61. 5	37
38	44 0.5	6753	287	61. 8	43 34.0	7073	278	61. 0	38
39	42 59.0	6536	293	61. 3	42 32.6	6846	284	60. 5	39
40	41 58.1	6321	299	60. 8	41 31.8	6619	290	59. 9	40
41	40 57.9	6107	305	60. 3	40 31.6	6393	297	59. 4	41
42	39 58.2	5894	312	59. 8	39 32.1	6168	303	58. 9	42
43	38 59.1	5682	319	59. 3	38 33.1	5945	310	58. 4	43
44	38 0.5	5471	326	58. 9	37 34.8	5723	317	58. 0	44
45	37 2.5	5263	334	58. 4	36 37.1	5503	325	57. 5	45
46	36 5.1	5056	341	58. 0	35 39.9	5286	333	57. 1	46
47	35 8.2	4850	349	57. 6	34 43.3	5071	340	56. 6	47
48	34 11.9	4649	358	57. 1	33 47.3	4858	349	56. 2	48
49	33 16.0	4449	366	56. 7	32 51.8	4649	357	55. 8	49
50	32 20.7	4252	375	56. 3	31 56.8	4442	366	55. 4	50
51	31 25.9	4059	384	56. 0	31 2.3	4238	375	55. 0	51
52	30 31.5	3867	394	55. 6	30 8.4	4039	385	54. 6	52
53	29 37.6	3680	404	55. 2	29 14.9	3842	395	54. 3	53
54	28 44.2	3496	414	54. 9	28 21.9	3649	405	53. 9	54
55	27 51.3	3316	424	54. 5	27 29.4	3460	416	53. 6	55
56	26 58.7	3138	436	54. 2	26 37.4	3275	427	53. 3	56
57	26 6.6	2965	447	53. 9	25 45.7	3095	438	52. 9	57
58	25 14.9	2797	459	53. 6	24 54.5	2917	450	52. 6	58
59	24 23.6	2632	471	53. 3	24 3.7	2745	462	52. 3	59
60	23 32.7	2472	484	53. 0	23 13.3	2578	475	52. 1	60
61	22 42.1	2316	497	52. 8	22 23.3	2414	489	51. 8	61
62	21 51.9	2164	511	52. 5	21 33.6	2256	503	51. 5	62
63	21 2.0	2017	526	52. 2	20 44.3	2102	517	51. 3	63
64	20 12.5	1874	541	52. 0	19 55.4	1954	533	51. 0	64
65	19 23.3	1737	557	51. 8	19 6.8	1810	549	50. 8	65

t° / L°	43° b	43° A	43° C	43° Z′	44° b	44° A	44° C	44° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	13587	166	90. 0	90 0.0	14307	158	90. 0	0
1	88 38.0	13581	166	89. 1	88 36.6	14300	158	89. 0	1
2	87 16.0	13564	166	88. 1	87 13.2	14282	158	88. 1	2
3	85 54.1	13535	167	87. 2	85 50.0	14252	159	87. 1	3
4	84 32.3	13495	167	86. 3	84 26.9	14208	159	86. 1	4
5	83 10.7	13444	168	85. 4	83 3.9	14154	160	85. 2	5
6	81 49.3	13382	169	84. 4	81 41.2	14087	161	84. 2	6
7	80 28.2	13308	169	83. 5	80 18.8	14008	161	83. 3	7
8	79 7.3	13224	170	82. 6	78 56.7	13918	162	82. 3	8
9	77 46.8	13129	172	81. 7	77 35.0	13817	164	81. 4	9
10	76 26.7	13025	173	80. 8	76 13.6	13705	165	80. 5	10
11	75 7.0	12911	174	79. 9	74 52.7	13581	166	79. 6	11
12	73 47.7	12786	176	79. 0	73 32.3	13448	168	78. 6	12
13	72 28.8	12652	177	78. 2	72 12.4	13305	169	77. 7	13
14	71 10.5	12510	179	77. 3	70 53.0	13153	171	76. 9	14
15	69 52.7	12357	181	76. 4	69 34.2	12991	173	76. 0	15
16	68 35.5	12198	183	75. 6	68 16.0	12820	175	75. 1	16
17	67 18.8	12029	185	74. 8	66 58.4	12641	178	74. 2	17
18	66 2.7	11855	188	73. 9	65 41.5	12454	180	73. 4	18
19	64 47.3	11672	190	73. 1	64 25.3	12259	182	72. 5	19
20	63 32.5	11483	193	72. 3	63 9.7	12058	185	71. 7	20
21	62 18.4	11288	196	71. 5	61 54.8	11850	188	70. 9	21
22	61 4.9	11087	199	70. 7	60 40.7	11637	191	70. 1	22
23	59 52.2	10880	202	70. 0	59 27.3	11416	194	69. 3	23
24	58 40.1	10669	205	69. 2	58 14.7	11191	197	68. 6	24
25	57 28.7	10453	209	68. 5	57 2.8	10961	201	67. 8	25
26	56 18.1	10231	212	67. 8	55 51.7	10727	204	67. 1	26
27	55 8.1	10008	216	67. 1	54 41.3	10489	208	66. 3	27
28	53 58.9	9780	220	66. 4	53 31.8	10248	212	65. 6	28
29	52 50.4	9549	224	65. 7	52 23.0	10003	216	64. 9	29
30	51 42.7	9316	229	65. 0	51 14.9	9756	221	64. 2	30
31	50 35.7	9080	233	64. 3	50 7.7	9507	225	63. 6	31
32	49 29.4	8843	238	63. 7	49 1.2	9255	230	62. 9	32
33	48 23.8	8605	242	63. 1	47 55.5	9004	234	62. 3	33
34	47 18.9	8364	248	62. 5	46 50.5	8750	239	61. 6	34
35	46 14.8	8124	253	61. 9	45 46.3	8496	245	61. 0	35
36	45 11.3	7883	258	61. 3	44 42.9	8242	250	60. 4	36
37	44 8.6	7642	264	60. 7	43 40.2	7988	256	59. 8	37
38	43 6.6	7401	270	60. 1	42 38.2	7734	262	59. 3	38
39	42 5.2	7161	276	59. 6	41 36.9	7481	267	58. 7	39
40	41 4.5	6922	282	59. 1	40 36.3	7229	274	58. 2	40
41	40 4.5	6683	288	58. 5	39 36.5	6979	280	57. 6	41
42	39 5.1	6447	295	58. 0	38 37.3	6730	287	57. 1	42
43	38 6.4	6212	302	57. 5	37 38.8	6483	294	56. 6	43
44	37 8.3	5979	309	57. 1	36 40.9	6238	301	56. 1	44
45	36 10.8	5747	317	56. 6	35 43.7	5996	309	55. 7	45
46	35 13.9	5520	324	56. 1	34 47.2	5756	316	55. 2	46
47	34 17.6	5294	332	55. 7	33 51.2	5520	324	54. 8	47
48	33 21.9	5071	341	55. 3	32 55.9	5286	332	54. 3	48
49	32 26.8	4850	349	54. 9	32 1.1	5056	341	53. 9	49
50	31 32.2	4634	358	54. 5	31 6.9	4828	350	53. 5	50
51	30 38.1	4421	367	54. 1	30 13.3	4605	359	53. 1	51
52	29 44.6	4211	377	53. 7	29 20.2	4386	369	52. 7	52
53	28 51.6	4005	387	53. 3	28 27.6	4171	379	52. 4	53
54	27 59.1	3804	397	53. 0	27 35.6	3960	389	52. 0	54
55	27 7.0	3607	408	52. 6	26 44.0	3753	400	51. 7	55
56	26 15.4	3413	418	52. 3	25 53.0	3552	410	51. 3	56
57	25 24.3	3223	430	52. 0	25 2.4	3354	422	51. 0	57
58	24 33.6	3039	442	51. 7	24 12.2	3162	434	50. 7	58
59	23 43.4	2859	454	51. 4	23 22.5	2974	446	50. 4	59
60	22 53.5	2684	467	51. 1	22 33.2	2792	459	50. 1	60
61	22 4.0	2514	481	50. 8	21 44.3	2614	473	49. 8	61
62	21 15.0	2349	495	50. 5	20 55.8	2442	487	49. 5	62
63	20 26.3	2189	509	50. 3	20 7.7	2275	501	49. 3	63
64	19 37.9	2033	524	50. 0	19 20.0	2113	516	49. 0	64
65	18 49.9	1883	540	49. 8	18 32.6	1957	532	48. 8	65

t° / L°	45° b	45° A	45° C	45° Z′	46° b	46° A	46° C	46° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	15051	151	90. 0	90 0.0	15823	143	90. 0	0
1	88 35.2	15045	151	89. 0	88 33.6	15816	143	89. 0	1
2	87 10.4	15025	151	88. 0	87 7.3	15794	143	87. 9	2
3	85 45.7	14991	151	87. 0	85 41.1	15759	144	86. 9	3
4	84 21.1	14945	152	86. 0	84 15.1	15709	144	85. 9	4
5	82 56.8	14886	152	85. 0	82 49.3	15646	145	84. 8	5
6	81 32.7	14815	153	84. 0	81 23.8	15571	145	83. 8	6
7	80 9.0	14732	154	83. 1	79 58.6	15480	146	82. 8	7
8	78 45.5	14635	155	82. 1	78 33.7	15376	147	81. 8	8
9	77 22.5	14526	156	81. 1	77 9.4	15261	148	80. 8	9
10	75 59.9	14406	157	80. 1	75 45.4	15131	150	79. 8	10
11	74 37.8	14275	159	79. 2	74 22.0	14990	151	78. 8	11
12	73 16.2	14132	160	78. 3	72 59.2	14839	153	77. 9	12
13	71 55.1	13980	162	77. 3	71 37.0	14676	154	76. 9	13
14	70 34.6	13816	164	76. 4	70 15.3	14501	156	75. 9	14
15	69 14.8	13644	166	75. 5	68 54.4	14317	158	75. 0	15
16	67 55.6	13461	168	74. 6	67 34.2	14122	160	74. 1	16
17	66 37.1	13270	170	73. 7	66 14.7	13919	162	73. 2	17
18	65 19.3	13071	172	72. 8	64 56.0	13705	165	72. 3	18
19	64 2.2	12865	175	72. 0	63 38.0	13485	167	71. 4	19
20	62 45.8	12650	178	71. 1	62 20.8	13256	170	70. 5	20
21	61 30.2	12428	180	70. 3	61 4.5	13021	173	69. 6	21
22	60 15.4	12200	183	69. 5	59 49.0	12779	176	68. 8	22
23	59 1.4	11965	186	68. 7	58 34.4	12531	179	68. 0	23
24	57 48.2	11727	190	67. 9	57 20.6	12277	182	67. 2	24
25	56 35.8	11482	193	67. 1	56 7.6	12018	186	66. 4	25
26	55 24.2	11234	197	66. 3	54 55.6	11755	189	65. 6	26
27	54 13.5	10982	201	65. 6	53 44.4	11486	193	64. 8	27
28	53 3.5	10726	205	64. 9	52 34.1	11215	197	64. 1	28
29	51 54.4	10468	209	64. 1	51 24.7	10942	201	63. 3	29
30	50 46.1	10206	213	63. 4	50 16.1	10666	206	62. 6	30
31	49 38.6	9942	217	62. 8	49 8.5	10387	210	61. 9	31
32	48 32.0	9677	222	62. 1	48 1.7	10107	215	61. 2	32
33	47 26.1	9411	227	61. 4	46 55.7	9825	219	60. 6	33
34	46 21.1	9143	232	60. 8	45 50.6	9544	224	59. 9	34
35	45 16.9	8875	237	60. 2	44 46.3	9261	230	59. 3	35
36	44 13.4	8607	243	59. 6	43 42.9	8980	235	58. 7	36
37	43 10.7	8340	248	59. 0	42 40.3	8697	241	58. 1	37
38	42 08.8	8073	254	58. 4	41 38.5	8416	247	57. 5	38
39	41 7.7	7807	260	57. 8	40 37.4	8137	252	56. 9	39
40	40 7.2	7542	266	57. 3	39 37.2	7859	259	56. 4	40
41	39 7.6	7279	273	56. 7	38 37.7	7582	265	55. 8	41
42	38 8.6	7017	279	56. 2	37 39.0	7308	272	55. 3	42
43	37 10.3	6758	286	55. 7	36 41.0	7036	279	54. 8	43
44	36 12.8	6501	293	55. 2	35 43.7	6767	286	54. 3	44
45	35 15.9	6247	301	54. 7	34 47.2	6501	293	53. 8	45
46	34 19.6	5996	309	54. 3	33 51.3	6238	301	53. 3	46
47	33 24.0	5747	317	53. 8	32 56.1	5979	309	52. 9	47
48	32 29.0	5503	325	53. 4	32 1.5	5723	317	52. 4	48
49	31 34.7	5263	333	53. 0	31 7.6	5471	326	52. 0	49
50	30 40.9	5025	342	52. 5	30 14.2	5223	335	51. 6	50
51	29 47.7	4792	352	52. 1	29 21.5	4980	344	51. 2	51
52	28 55.1	4562	361	51. 8	28 29.4	4740	354	50. 8	52
53	28 3.0	4338	371	51. 4	27 37.8	4507	364	50. 4	53
54	27 11.5	4118	381	51. 0	26 46.8	4277	374	50. 0	54
55	26 20.5	3902	392	50. 7	25 56.3	4053	384	49. 7	55
56	25 29.9	3692	403	50. 3	25 6.3	3833	396	49. 4	56
57	24 39.9	3487	414	50. 0	24 16.9	3618	407	49. 0	57
58	23 50.3	3285	426	49. 7	23 27.9	3410	419	48. 7	58
59	23 1.2	3090	439	49. 4	22 39.3	3205	431	48. 4	59
60	22 12.5	2899	451	49. 1	21 51.2	3007	444	58. 1	60
61	21 24.2	2715	465	48. 8	21 3.6	2816	457	47. 8	61
62	20 36.3	2535	479	48. 6	20 16.3	2629	471	47. 6	62
63	19 48.8	2362	493	48. 3	19 29.5	2449	486	47. 3	63
64	19 1.7	2194	509	48. 1	18 43.0	2275	501	47. 1	64
65	18 14.9	2031	525	47. 8	17 56.9	2106	517	46. 8	65

t° / L°	47° b	47° A	47° C	47° Z′	48° b	48° A	48° C	48° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	16622	136	90. 0	90 0.0	17449	129	90. 0	0
1	88 32.0	16613	136	88. 9	88 30.3	17440	129	88. 9	1
2	87 4.1	16592	136	87. 9	87 0.8	17416	129	87. 8	2
3	85 36.3	16554	136	86. 8	85 31.3	17376	130	86. 7	3
4	84 8.7	16500	137	85. 7	84 2.0	17319	130	85. 6	4
5	82 41.4	16433	138	84. 7	82 33.1	17246	131	84. 5	5
6	81 14.3	16351	138	83. 6	81 4.4	17158	131	83. 4	6
7	79 47.6	16253	139	82. 6	79 36.1	17054	132	82. 3	7
8	78 21.4	16143	140	81. 5	78 8.3	16936	133	81. 2	8
9	76 55.5	16019	141	80. 5	76 41.0	16803	134	80. 1	9
10	75 30.2	15882	142	79. 5	75 14.2	16656	135	79. 1	10
11	74 5.5	15731	144	78. 4	73 48.1	16495	137	78. 0	11
12	72 41.4	15568	145	77. 4	72 22.6	16321	138	77. 0	12
13	71 17.9	15394	147	76. 4	70 57.9	16134	140	76. 0	13
14	69 55.1	15208	149	75. 5	69 33.8	15935	142	75. 0	14
15	68 33.0	15010	151	74. 5	68 10.6	15725	144	74. 0	15
16	67 11.7	14802	153	73. 5	66 48.2	15504	146	73. 0	16
17	65 51.2	14586	155	72. 6	65 26.6	15272	148	72. 0	17
18	64 31.5	14359	158	71. 7	64 6.0	15031	150	71. 1	18
19	63 12.7	14124	160	70. 8	62 46.2	14781	153	70. 1	19
20	61 54.7	13882	163	69. 9	61 27.4	14522	156	69. 2	20
21	60 37.6	13631	166	69. 0	60 9.5	14255	159	68. 3	21
22	59 21.4	13373	169	68. 1	58 52.6	13982	162	67. 4	22
23	58 6.1	13108	172	67. 3	57 36.6	13702	165	66. 5	23
24	56 51.7	12839	175	66. 4	56 21.7	13416	168	65. 7	24
25	55 38.3	12566	179	65. 6	55 7.7	13125	172	64. 9	25
26	54 25.8	12286	182	64. 8	53 54.7	12830	175	64. 0	26
27	53 14.2	12003	186	64. 0	52 42.7	12530	179	63. 2	27
28	52 3.5	11716	190	63. 3	51 31.7	12227	183	62. 5	28
29	50 53.8	11427	194	62. 5	50 21.7	11921	187	61. 7	29
30	49 45.0	11135	198	61. 8	49 12.7	11612	191	61. 0	30
31	48 37.1	10841	203	61. 1	48 4.6	11302	196	60. 2	31
32	47 30.2	10544	207	60. 4	46 57.5	10991	200	59. 5	32
33	46 24.1	10248	212	59. 7	45 51.4	10679	205	58. 8	33
34	45 19.0	9951	217	59. 1	44 46.2	10366	210	58. 2	34
35	44 14.7	9654	223	58. 4	43 42.0	10053	215	57. 5	35
36	43 11.3	9358	228	57. 8	42 38.7	9740	221	56. 9	36
37	42 8.8	9060	234	57. 2	41 36.2	9429	226	56. 2	37
38	41 7.1	8766	239	56. 6	40 34.7	9120	232	55. 6	38
39	40 6.2	8472	245	56. 0	39 34.0	8812	238	55. 0	39
40	39 6.2	8180	252	55. 6	38 34.2	8506	244	54. 5	40
41	38 7.0	7890	258	54. 9	37 35.2	8202	251	53. 9	41
42	37 8.5	7602	265	54. 3	36 37.1	7901	258	53. 4	42
43	36 10.8	7318	272	53. 8	35 39.7	7603	265	52. 9	43
44	35 13.9	7036	279	53. 3	34 43.1	7308	272	52. 4	44
45	34 17.6	6758	286	52. 8	33 47.3	7017	279	51. 9	45
46	33 22.1	6483	294	52. 4	32 52.2	6730	287	51. 4	46
47	32 27.3	6212	302	51. 9	31 57.8	6447	295	50. 9	47
48	31 33.2	5945	310	51. 4	31 4.1	6168	303	50. 5	48
49	30 39.7	5682	319	51. 0	30 11.1	5894	312	50. 0	49
50	29 46.9	5423	328	50. 6	29 18.8	5625	321	49. 6	50
51	28 54.6	5169	337	50. 2	28 27.1	5360	330	49. 2	51
52	28 3.0	4920	347	49. 6	27 36.0	5100	339	48. 8	52
53	27 12.0	4676	356	49. 4	26 45.5	4846	349	48. 4	53
54	26 21.5	4437	367	49. 1	25 55.6	4597	359	48. 1	54
55	25 31.6	4203	377	48. 7	25 6.3	4354	370	47. 7	55
56	24 42.2	3974	388	48. 4	24 17.5	4117	381	47. 4	56
57	23 53.3	3751	400	48. 0	23 29.2	3885	392	47. 0	57
58	23 4.9	3534	412	47. 7	22 41.4	3659	404	46. 7	58
59	22 17.0	3323	424	47. 4	21 54.2	3439	417	46. 4	59
60	21 29.5	3117	437	47. 1	21 7.4	3226	430	46. 1	60
61	20 42.5	2917	450	46. 8	20 21.0	3019	443	45. 8	61
62	19 55.9	2724	464	46. 6	19 35.1	2818	457	45. 6	62
63	19 9.7	2536	479	46. 3	18 49.6	2624	472	45. 3	63
64	18 23.9	2355	494	46. 1	18 4.5	2436	487	45. 1	64
65	17 38.5	2180	510	45. 8	17 19.7	2255	503	44. 8	65

t° / L°	49° b	49° A	49° C	49° Z′	50° b	50° A	50° C	50° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	18306	122	90. 0	90 0.0	19193	115	90. 0	0
1	88 28.6	18297	122	88. 9	88 26.7	19183	116	88. 8	1
2	86 57.2	18271	122	87. 7	86 53.4	19155	116	87. 6	2
3	85 26.0	18227	123	86. 6	85 20.3	19109	116	86. 4	3
4	83 55.0	18166	123	85. 6	83 47.5	19043	117	85. 2	4
5	82 24.2	18088	124	84. 3	82 15.0	18959	117	84. 1	5
6	80 53.9	17994	124	83. 1	80 42.8	18858	118	82. 9	6
7	79 24.0	17883	125	82. 0	79 11.1	18740	119	81. 7	7
8	77 54.5	17756	126	80. 9	77 40.0	18604	120	80. 6	8
9	76 25.6	17614	128	79. 8	76 9.5	18452	121	79. 4	9
10	74 57.4	17456	129	78. 7	74 39.6	18283	122	78. 3	10
11	73 29.8	17284	130	77. 6	73 10.5	18099	124	77. 2	11
12	72 2.9	17098	132	76. 5	71 42.1	17899	125	76. 1	12
13	70 36.8	16898	133	75. 5	70 14.6	17685	127	75. 0	13
14	69 11.5	16685	135	74. 4	68 48.0	17459	129	73. 9	14
15	67 47.0	16461	137	73. 4	67 22.3	17220	131	72. 9	15
16	66 23.5	16226	139	72. 4	65 57.5	16968	133	71. 8	16
17	65 0.8	15979	142	71. 4	64 33.8	16705	135	70. 8	17
18	63 39.2	15722	144	70. 4	63 11.0	16432	138	69. 8	18
19	62 18.5	15456	147	69. 5	61 49.4	16148	140	68. 8	19
20	60 58.8	15181	149	68. 5	60 28.8	15856	143	67. 8	20
21	59 40.1	14898	152	67. 6	59 9.3	15555	146	66. 9	21
22	58 22.4	14607	155	66. 7	57 50.9	15247	149	65. 9	22
23	57 5.8	14310	158	65. 8	56 33.6	14932	152	65. 0	23
24	55 50.3	14007	161	64. 9	55 17.5	14611	155	64. 1	24
25	54 35.8	13699	165	64. 1	54 2.5	14284	158	63. 3	25
26	53 22.3	13386	169	63. 2	52 48.6	13953	162	62. 6	26
27	52 9.9	13069	172	62. 6	51 35.8	13618	166	61. 6	27
28	50 58.6	12748	176	61. 6	50 24.2	13280	170	60. 8	28
29	49 48.3	12425	180	60. 9	49 13.6	12939	174	60. 0	29
30	48 39.1	12100	185	60. 1	48 4.2	12595	178	59. 2	30
31	47 30.9	11773	189	59. 4	46 55.9	12250	183	58. 5	31
32	46 23.7	11444	194	58. 6	45 48.6	11905	187	57. 7	32
33	45 17.5	11115	199	57. 9	44 42.4	11559	192	57. 0	33
34	44 12.3	10787	204	57. 2	43 37.2	11213	197	56. 3	34
35	43 8.1	10458	209	56. 6	42 33.1	10868	202	55. 6	35
36	42 4.9	10130	214	55. 9	41 30.0	10524	208	55. 0	36
37	41 2.6	9803	220	55. 3	40 27.9	10181	213	54. 4	37
38	40 1.2	9478	226	54. 7	39 26.7	9841	219	53. 7	38
39	39 0.8	9155	232	54. 1	38 26.5	9503	225	53. 1	39
40	38 1.2	8834	238	53. 5	37 27.2	9167	231	52. 5	40
41	37 2.5	8516	244	53. 0	36 28.9	8834	238	52. 0	41
42	36 4.7	8202	251	52. 4	35 31.3	8506	244	51. 4	42
43	35 7.7	7890	258	51. 9	34 34.7	8181	252	50. 9	43
44	34 11.5	7582	265	51. 4	33 38.9	7859	259	50. 4	44
45	33 16.0	7278	273	50. 9	32 44.0	7542	266	49. 9	45
46	32 21.4	6979	280	50. 4	31 49.8	7230	274	49. 4	46
47	31 27.5	6684	288	49. 9	30 56.4	6922	282	48. 9	47
48	30 34.3	6393	297	49. 5	30 3.7	6619	290	48. 5	48
49	29 41.8	6108	305	49. 0	29 11.7	6322	299	48. 0	49
50	28 50.0	5827	314	48. 6	28 20.4	6030	307	47. 6	50
51	27 58.8	5551	323	48. 2	27 29.9	5744	317	47. 2	51
52	27 8.3	5281	333	47. 8	26 40.0	5463	326	46. 8	52
53	26 18.4	5017	343	47. 4	25 50.7	5188	336	46. 4	53
54	25 29.1	4758	353	47. 1	25 2.0	4920	346	46. 0	54
55	24 40.4	4506	364	46. 7	24 13.9	4659	357	45. 7	55
56	23 52.2	4260	375	46. 4	23 26.4	4403	368	45. 3	56
57	23 4.6	4019	386	46. 0	22 39.4	4153	379	45. 0	57
58	22 17.5	3785	398	45. 7	21 53.0	3910	391	44. 7	58
59	21 30.9	3557	410	45. 4	21 7.1	3674	404	44. 4	59
60	20 44.7	3336	423	45. 1	20 21.6	3445	417	44. 1	60
61	19 59.1	3120	437	44. 8	19 36.7	3222	430	43. 8	61
62	19 13.8	2913	451	44. 6	18 52.1	3007	444	43. 5	62
63	18 29.0	2712	465	44. 3	18 8.1	2799	459	43. 3	63
64	17 44.6	2517	480	44. 0	17 24.4	2598	474	43. 0	64
65	17 0.6	2330	496	43. 8	16 41.1	2405	490	42. 8	65

t° / L°	51° b	51° A	51° C	51° Z′	52° b	52° A	52° C	52° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	20113	110	90. 0	90 0.0	21066	103	90. 0	0
1	88 24.7	20103	110	88. 8	88 22.6	21055	104	88. 7	1
2	86 49.4	20072	110	87. 5	86 45.2	21022	104	87. 4	2
3	85 14.4	20022	110	86. 3	85 8.1	20969	104	86. 2	3
4	83 39.6	19953	111	85. 1	83 31.2	20894	105	84. 9	4
5	82 5.1	19863	111	83. 9	81 54.7	20797	105	83. 6	5
6	80 31.1	19753	112	82. 6	80 18.7	20681	106	82. 4	6
7	78 57.6	19626	113	81. 4	78 43.3	20543	107	81. 1	7
8	77 24.7	19481	114	80. 2	77 8.5	20387	108	79. 9	8
9	75 52.4	19317	115	79. 1	75 34.4	20213	109	78. 7	9
10	74 20.9	19136	116	77. 9	74 1.1	20019	110	77. 5	10
11	72 50.1	18940	118	76. 7	72 28.7	19808	112	76. 3	11
12	71 20.2	18726	119	75. 6	70 57.2	19580	113	75. 1	12
13	69 51.3	18498	121	74. 5	69 26.7	19337	115	73. 9	13
14	68 23.2	18257	123	73. 4	67 57.2	19077	117	72. 8	14
15	66 56.2	18001	125	72. 3	66 28.8	18805	119	71. 6	15
16	65 30.2	17732	127	71. 2	65 1.6	18519	121	70. 6	16
17	64 5.3	17452	129	70. 1	63 35.5	18219	123	69. 5	17
18	62 41.6	17160	131	69. 1	62 10.6	17909	125	68. 4	18
19	61 18.9	16860	134	68. 1	60 47.0	17589	128	67. 4	19
20	59 57.4	16549	137	67. 1	59 24.5	17259	130	66. 4	20
21	58 37.1	16230	140	66. 1	58 3.4	16919	133	65. 4	21
22	57 18.0	15902	142	65. 2	56 43.5	16573	136	64. 4	22
23	56 0.0	15568	145	64. 2	55 24.9	16219	139	63. 4	23
24	54 43.3	15228	148	63. 3	54 7.6	15858	143	62. 5	24
25	53 27.8	14881	152	62. 4	52 51.6	15493	146	61. 6	25
26	52 13.4	14532	156	61. 6	51 36.8	15123	150	60. 7	26
27	51 0.3	14178	160	60. 7	50 23.3	14749	154	59. 8	27
28	49 48.3	13820	163	59. 9	49 11.1	14372	158	59. 0	28
29	48 37.6	13460	168	59. 1	48 0.1	13993	162	58. 2	29
30	47 28.0	13099	172	58. 3	46 50.4	13612	166	57. 4	30
31	46 19.5	12736	176	57. 5	45 41.8	13230	171	56. 6	31
32	45 12.2	12373	181	56. 8	44 34.5	12847	175	55. 9	32
33	44 6.0	12009	186	56. 1	43 28.3	12465	180	55. 1	33
34	43 0.9	11646	191	55. 4	42 23.3	12084	185	54. 4	34
35	41 56.9	11283	196	54. 7	41 19.4	11704	190	53. 7	35
36	40 53.9	10923	202	54. 0	40 16.6	11326	196	53. 0	36
37	39 52.0	10563	207	53. 4	39 15.0	10951	201	52. 4	37
38	38 51.1	10207	214	52. 8	38 14.3	10577	207	51. 6	38
39	37 51.1	9853	219	52. 1	37 14.7	10207	213	51. 1	39
40	36 52.2	9503	225	51. 6	36 16.1	9841	219	50. 6	40
41	35 54.2	9154	232	51. 0	35 18.5	9479	226	50. 0	41
42	34 57.1	8811	238	50. 4	34 21.8	9119	232	49. 4	42
43	34 0.8	8472	245	49. 9	33 26.0	8766	239	48. 9	43
44	33 5.5	8137	253	49. 4	32 31.1	8416	247	48. 4	44
45	32 11.0	7807	260	48. 9	31 37.1	8073	254	47. 9	45
46	31 17.3	7481	268	48. 4	30 44.0	7734	262	47. 4	46
47	30 24.4	7161	276	47. 9	29 51.6	7401	270	46 9	47
48	29 32.3	6846	284	47. 5	29 0.1	7073	278	46. 4	48
49	28 40.9	6536	293	47. 0	28 9.3	6753	287	46. 0	49
50	27 50.2	6233	301	46. 6	27 19.3	6438	295	45. 6	50
51	27 0.2	5937	311	46. 2	26 29.9	6130	305	45. 2	51
52	26 10.9	5646	320	45. 8	25 41.3	5827	314	44. 8	52
53	25 22.3	5361	330	45. 4	24 53.3	5532	324	44. 4	53
54	24 34.3	5082	340	45. 0	24 6.0	5244	334	44. 0	54
55	23 46.9	4810	351	44. 7	23 19.2	4963	345	43. 6	55
56	23 0.0	4545	362	44. 3	22 33.1	4688	356	43. 3	56
57	22 13.7	4287	373	44. 0	21 47.5	4420	367	43. 0	57
58	21 28.0	4036	385	43. 7	21 2.5	4161	379	42. 7	58
59	20 42.8	3792	398	43. 4	20 18.0	3909	392	42. 3	59
60	19 58.1	3554	411	43. 1	19 34.1	3663	405	42. 1	60
61	19 13.8	3324	424	42. 8	18 50.6	3426	418	41. 8	61
62	18 30.1	3101	437	42. 5	18 7.6	3195	432	41. 5	62
63	17 46.7	2887	452	42. 3	17 25.0	2973	446	41. 2	63
64	17 3.8	2678	468	42. 0	16 42.8	2759	462	41. 0	64
65	16 21.3	2479	484	41. 8	16 1.1	2553	478	40. 8	65

t° / L°	53° b	53° A	53° C	53° Z′	54° b	54° A	54° C	54° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	22054	98	90. 0	90 0.0	23078	92	90. 0	0
1	88 20.3	22042	98	88. 7	88 17.9	23066	92	88. 6	1
2	86 40.7	22006	98	87. 3	86 36.0	23028	92	87. 3	2
3	85 1.4	21950	98	86. 0	84 54.3	22966	93	85. 9	3
4	83 22.3	21868	99	84. 7	83 12.9	22879	93	84. 5	4
5	81 43.7	21766	99	83. 4	81 32.0	22769	94	83. 2	5
6	80 5.6	21640	100	82. 1	79 51.7	22632	94	81. 6	6
7	78 28.1	21493	101	80. 8	78 12.1	22476	95	80. 5	7
8	76 51.3	21326	102	79. 5	76 33.2	22296	96	79. 2	8
9	75 15.3	21138	103	78. 3	74 55.2	22094	97	77. 8	9
10	73 40.2	20931	104	77. 0	73 18.1	21872	99	76. 6	10
11	72 6.0	20704	106	75. 8	71 42.1	21629	100	75. 3	11
12	70 32.8	20460	107	74. 6	70 7.1	21368	102	74. 0	12
13	69 0.7	20201	109	73. 4	68 33.4	21090	103	72. 8	13
14	67 29.8	19923	111	72. 2	67 0.9	20795	105	71. 6	14
15	66 0.0	19632	113	71. 0	65 29.6	20484	107	70. 4	15
16	64 31.4	19328	115	69. 9	63 59.7	20158	109	69. 2	16
17	63 4.1	19008	117	68. 8	62 31.2	19820	111	68. 1	17
18	61 38.1	18679	119	67. 7	61 4.0	19468	114	67. 0	18
19	60 13.4	18338	122	66. 6	59 38.3	19104	116	65. 9	19
20	58 50.1	17987	125	65. 6	58 14.0	18732	119	64. 8	20
21	57 28.1	17627	128	64. 6	56 51.2	18349	122	63. 7	21
22	56 7.5	17257	131	63. 6	55 29.8	17959	125	62. 7	22
23	54 48.2	16883	134	62. 6	54 9.9	17561	128	61. 7	23
24	53 30.3	16501	137	61. 6	52 51.4	17159	131	60. 8	24
25	52 13.8	16116	140	60. 7	51 34.4	16750	135	59. 8	25
26	50 58.6	15723	144	59. 8	50 18.9	16337	138	58. 9	26
27	49 44.8	15330	148	58. 9	49 4.8	15920	142	58. 0	27
28	48 32.3	14932	152	58. 1	47 52.1	15501	146	57. 1	28
29	47 21.2	14532	156	57. 2	46 40.7	15081	150	56. 3	29
30	46 11.3	14131	160	56. 4	45 30.8	14660	155	55. 5	30
31	45 2.7	13730	165	55. 6	44 22.2	14238	159	54. 7	31
32	43 55.4	13328	169	54. 9	43 14.9	13816	164	53. 9	32
33	42 49.3	12928	174	54. 1	42 8.9	13395	168	53. 1	33
34	41 44.4	12528	179	53. 4	41 4.2	12975	173	52. 4	34
35	40 40.7	12129	184	52. 7	40 0.7	12558	179	51. 7	35
36	39 38.2	11734	190	52. 0	38 58.4	12144	184	51. 0	36
37	38 36.7	11340	195	51. 4	37 57.3	11734	190	50. 4	37
38	37 36.4	10951	201	50. 8	36 57.3	11326	196	49. 7	38
39	36 37.1	10564	207	50. 1	35 58.5	10923	202	49. 1	39
40	35 38.9	10181	213	49. 5	35 0.7	10523	208	48. 5	40
41	34 41.7	9803	220	49. 0	34 3.9	10130	214	47. 9	41
42	33 45.5	9430	227	48. 4	33 8.2	9741	221	47. 4	42
43	32 50.2	9061	234	47. 9	32 13.4	9358	228	46. 8	43
44	31 55.9	8697	241	47. 3	31 19.7	8980	235	46. 3	44
45	31 2.4	8340	248	46. 8	30 26.8	8607	242	45. 8	45
46	30 9.8	7988	256	46. 3	29 34.8	8242	250	45. 3	46
47	29 18.1	7642	264	45. 9	28 43.7	7883	258	44. 8	47
48	28 27.1	7303	272	45. 4	27 53.4	7531	267	44. 4	48
49	27 37.0	6969	281	45. 0	27 3.9	7185	275	43. 9	49
50	26 47.6	6642	290	44. 5	26 15.2	6846	284	43. 5	50
51	25 58.9	6322	299	44. 1	25 27.2	6516	293	43. 1	51
52	25 10.9	6010	308	43. 7	24 40.0	6192	303	42. 7	52
53	24 23.7	5704	318	43. 3	23 53.4	5875	313	42. 3	53
54	23 37.0	5405	328	43. 0	23 7.5	5566	323	41. 9	54
55	22 51.0	5114	339	42. 6	22 22.2	5266	333	41. 6	55
56	22 5.6	4830	350	42. 3	21 37.6	4973	344	41. 2	56
57	21 20.8	4554	362	41. 9	20 53.5	4687	356	40. 9	57
58	20 36.5	4286	373	41. 6	20 10.1	4410	368	40. 6	58
59	19 52.8	4025	386	41. 3	19 27.1	4141	380	40. 3	59
60	19 9.6	3772	399	41. 0	18 44.7	3880	393	40. 0	60
61	18 26.9	3527	412	40. 7	18 2.8	3627	406	39. 7	61
62	17 44.7	3290	426	40. 5	17 21.3	3383	420	39. 5	62
63	17 2.9	3060	441	40. 2	16 40.4	3146	434	39. 2	63
64	16 21.5	2840	456	40. 0	15 59.8	2918	450	39. 0	64
65	15 40.5	2626	472	39. 7	15 19.7	2700	466	38. 7	65

t° / L°	55° b	55° A	55° C	55° Z′	56° b	56° A	56° C	56° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	24141	87	90. 0	90 0.0	25244	81	90. 0	0
1	88 15.4	24128	87	88. 6	88 12.7	25229	81	88. 5	1
2	86 31.0	24087	87	87. 1	86 25.6	25186	82	87. 0	2
3	84 46.8	24020	87	85. 7	84 38.8	25113	82	85. 6	3
4	83 2.9	23927	88	84. 3	82 52.3	25012	82	84. 1	4
5	81 19.6	23807	88	82. 9	81 6.5	24885	83	82. 6	5
6	79 37.0	23663	89	81. 5	79 21.3	24728	84	81. 2	6
7	77 55.0	23493	90	80. 1	77 36.9	24547	85	79. 8	7
8	76 13.9	23300	91	78. 8	75 53.5	24339	86	78. 3	8
9	74 33.8	23083	92	77. 4	74 11.2	24107	87	76. 9	9
10	72 54.7	22845	93	76. 1	72 29.9	23850	88	75. 6	10
11	71 16.7	22585	95	74. 8	70 49.9	23573	89	74. 2	11
12	69 40.0	22306	96	73. 5	69 11.3	23274	91	72. 9	12
13	68 4.5	22008	98	72. 2	67 34.0	22953	93	71. 6	13
14	66 30.4	21692	100	70. 9	65 58.1	22616	95	70. 3	14
15	64 57.6	21360	102	69. 7	64 23.9	22261	96	69. 0	15
16	63 26.3	21012	104	68. 5	62 51.1	21890	99	67. 8	16
17	61 56.5	20651	106	67. 3	61 20.0	21505	101	66. 6	17
18	60 28.2	20277	108	66. 2	59 50.5	21106	103	65. 4	18
19	59 1.4	19891	111	65. 1	58 22.6	20696	106	64. 2	19
20	57 36.1	19495	114	64. 0	56 56.4	20275	108	63. 1	20
21	56 12.5	19089	116	62. 9	55 31.9	19845	111	62. 0	21
22	54 50.4	18675	119	61. 9	54 9.1	19407	114	60. 9	22
23	53 29.8	18255	123	60. 8	52 47.9	18960	117	59. 9	23
24	52 10.8	17827	126	59. 8	51 28.4	18508	121	58. 9	24
25	50 53.4	17396	129	58. 9	50 10.5	18052	124	57. 9	25
26	49 37.5	16960	133	58. 0	48 54.3	17593	128	57. 0	26
27	48 23.1	16521	137	57. 0	47 39.7	17129	132	56. 1	27
28	47 10.2	16080	141	56. 2	46 26.6	16665	135	55. 2	28
29	45 58.7	15636	145	55. 3	45 15.1	16200	140	54. 3	29
30	44 48.6	15194	149	54. 5	44 5.1	15734	144	53. 5	30
31	43 40.1	14750	154	53. 7	42 56.6	15268	148	52. 6	31
32	42 33.0	14308	158	52. 9	41 49.5	14805	153	51. 8	32
33	41 27.1	13867	163	52. 1	40 43.9	14343	158	51. 1	33
34	40 22.6	13428	168	51. 4	39 39.6	13884	163	50. 3	34
35	39 19.3	12992	173	50. 7	38 36.7	13428	168	49. 6	35
36	38 17.4	12558	179	50. 0	37 35.0	12975	173	48. 9	36
37	37 16.6	12129	184	49. 3	36 34.7	12528	179	48. 3	37
38	36 17.0	11704	190	48. 7	35 35.6	12084	185	47. 6	38
39	35 18.6	11283	196	48. 1	34 37.6	11646	191	47. 0	39
40	34 21.3	10868	202	47. 4	33 40.8	11213	197	46. 4	40
41	33 25.1	10458	209	46. 9	32 45.1	10786	204	45. 8	41
42	32 29.9	10053	216	46. 3	31 50.5	10366	210	45. 2	42
43	31 35.7	9654	223	45. 8	30 57.0	9951	217	44. 7	43
44	30 42.5	9261	230	45. 2	30 4.4	9544	224	44. 2	44
45	29 50.3	8875	237	44. 7	29 12.8	9143	232	43. 6	45
46	28 58.9	8496	245	44. 2	28 22.2	8750	240	43. 2	46
47	28 8.5	8124	253	43. 8	27 32.4	8364	248	42. 7	47
48	27 18.8	7759	261	43. 3	26 43.5	7986	256	42. 2	48
49	26 30.1	7401	270	42. 9	25 55.5	7616	264	41. 8	49
50	25 42.1	7050	279	42. 6	25 8.2	7254	273	41. 4	50
51	24 54.8	6708	288	42. 0	24 21.7	6899	283	41. 0	51
52	24 8.3	6373	297	41. 6	23 36.0	6554	292	40. 6	52
53	23 22.5	6046	307	41. 2	22 51.0	6216	302	40. 2	53
54	22 37.4	5727	317	40. 9	22 6.6	5887	312	39. 8	54
55	21 52.9	5416	328	40. 5	21 23.0	5566	323	39. 5	55
56	21 9.0	5114	339	40. 2	20 39.9	5254	334	39. 1	56
57	20 25.8	4820	350	39. 9	19 57.5	4951	345	38. 8	57
58	19 43.1	4534	362	39. 5	19 15.6	4656	357	38. 5	58
59	19 1.0	4257	375	39. 2	18 34.3	4371	370	38. 2	59
60	18 19.3	3987	388	39. 0	17 53.6	4094	382	37. 9	60
61	17 38.2	3727	401	38. 7	17 13.3	3826	396	37. 6	61
62	16 57.6	3475	415	38. 4	16 33.5	3567	410	37. 4	62
63	16 17.5	3232	430	38. 2	15 54.2	3317	424	37. 1	63
64	15 37.7	2998	445	37. 9	15 15.3	3076	440	36. 9	64
65	14 58.4	2772	461	37. 7	14 36.9	2844	455	36. 7	65

t° / L°	57° b	57° A	57° C	57° Z′	58° b	58° A	58° C	58° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	26389	76	90. 0	90 0.0	27579	72	90. 0	0
1	88 9.9	26374	76	88. 5	88 6.8	27563	72	88. 4	1
2	86 19.9	26326	77	86. 9	86 13.8	27512	72	86. 8	2
3	84 30.2	26249	77	85. 4	84 21.1	27428	72	85. 2	3
4	82 41.0	26139	77	83. 9	82 29.0	27309	73	83. 6	4
5	80 52.5	26001	78	82. 4	80 37.5	27161	73	82. 1	5
6	79 4.6	25834	79	80. 9	78 46.9	26980	74	80. 5	6
7	77 17.7	25638	80	79. 4	76 57.3	26769	75	79. 0	7
8	75 31.8	25415	81	77. 9	75 8.8	26528	76	77. 4	8
9	73 47.1	25163	82	76. 5	73 21.6	26259	77	75. 9	9
10	72 3.6	24890	83	75. 0	71 35.7	25964	78	74. 5	10
11	70 21.5	24592	84	73. 6	69 51.4	25644	80	73. 0	11
12	68 40.8	24271	86	72. 2	68 8.6	25298	81	71. 6	12
13	67 1.7	23929	88	70. 9	66 27.5	24933	83	70. 2	13
14	65 24.1	23568	90	69. 6	64 48.2	24546	85	68. 8	14
15	63 48.2	23188	91	68. 3	63 10.6	24141	87	67. 5	15
16	62 14.0	22793	94	67. 0	61 34.9	23718	89	66. 2	16
17	60 41.6	22381	96	65. 8	60 1.1	23281	91	64. 9	17
18	59 10.8	21956	98	64. 6	58 29.1	22829	93	63. 7	18
19	57 41.9	21521	101	63. 4	56 59.1	22364	96	62. 5	19
20	56 14.8	21074	103	62. 2	55 31.0	21889	99	61. 3	20
21	54 49.4	20617	106	61. 1	54 4.9	21404	101	60. 2	21
22	53 25.9	20152	109	60. 0	52 40.6	20911	104	59. 1	22
23	52 4.1	19680	112	59. 0	51 18.3	20413	108	58. 0	23
24	50 44.1	19202	116	57. 9	49 57.8	19908	111	56. 9	24
25	49 25.8	18720	119	56. 9	48 39.2	19401	114	55. 9	25
26	48 9.3	18236	123	56. 0	47 22.4	18887	118	54. 9	26
27	46 54.5	17748	127	55. 0	46 7.4	18376	122	54. 0	27
28	45 41.3	17259	130	54. 1	44 54.2	17860	126	53. 1	28
29	44 29.8	16770	135	53. 3	43 42.7	17347	130	52. 2	29
30	43 19.8	16281	139	52. 4	42 32.8	16834	134	51. 3	30
31	42 11.4	15793	143	51. 6	41 24.6	16321	139	50. 5	31
32	41 4.5	15307	148	50. 8	40 18.0	15813	143	49. 7	32
33	39 59.1	14824	153	50. 0	39 12.9	15307	148	48. 9	33
34	38 55.2	14343	158	49. 3	38 9.3	14805	153	48. 2	34
35	37 52.6	13867	163	48. 5	37 7.1	14308	158	47. 5	35
36	36 51.4	13395	168	47. 9	36 6.4	13816	164	46. 8	36
37	35 51.5	12928	174	47. 2	35 7.0	13328	169	46. 1	37
38	34 52.8	12465	180	46. 5	34 8.9	12847	175	45. 4	38
39	33 55.4	12009	186	45. 9	33 12.0	12373	181	44. 8	39
40	32 59.2	11558	192	45. 3	32 16.4	11905	187	44. 2	40
41	32 4.1	11115	199	44. 7	31 22.0	11443	194	43. 6	41
42	31 10.1	10678	205	44. 1	30 28.7	10991	201	43. 0	42
43	30 17.2	10248	212	43. 6	29 36.5	10544	207	42. 5	43
44	29 25.4	9825	219	43. 1	28 45.3	10107	215	42. 0	44
45	28 34.5	9411	227	42. 6	27 55.2	9677	222	41. 5	45
46	27 44.5	9004	235	42. 1	27 6.0	9256	230	41. 0	46
47	26 55.5	8605	243	41. 6	26 17.8	8843	238	40. 5	47
48	26 7.4	8213	251	41. 1	25 30.5	8438	246	40. 1	48
49	25 20.1	7831	259	40. 7	24 44.0	8044	255	39. 6	49
50	24 33.6	7456	268	40. 3	23 58.4	7657	264	39. 2	50
51	23 48.0	7090	278	39. 9	23 13.5	7279	273	38. 8	51
52	23 3.0	6733	287	39. 5	22 29.4	6911	282	38. 4	52
53	22 18.8	6385	297	39. 1	21 46.1	6552	292	38. 0	53
54	21 35.3	6046	307	38. 8	21 3.4	6202	302	37. 7	54
55	20 52.5	5715	318	38. 4	20 21.5	5862	313	37. 3	55
56	20 10.3	5394	329	38. 1	19 40.1	5531	324	37. 0	56
57	19 28.7	5082	340	37. 8	18 59.4	5210	335	36. 7	57
58	18 47.7	4778	352	37. 4	18 19.3	4899	347	36. 4	58
59	18 7.2	4484	365	37. 1	17 39.7	4596	360	36. 1	59
60	17 27.3	4199	377	36. 9	17 0.7	4304	373	35. 8	60
61	16 47.9	3924	391	36. 6	16 22.2	4021	386	35. 5	61
62	16 9.0	3658	405	36. 3	15 44.2	3748	400	35. 3	62
63	15 30.6	3401	419	36. 1	15 6.6	3483	415	35. 0	63
64	14 52.6	3153	435	35. 9	14 29.5	3230	430	34. 8	64
65	14 15.0	2915	450	35. 6	13 52.8	2985	446	34. 6	65

t° / L°	59° b	A	C	Z′	60° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	28816	67	90. 0	90 0.0	30103	62	90. 0	0
1	88 3.5	28797	67	88. 3	88 0.0	30083	63	88. 3	1
2	86 7.3	28742	67	86. 7	86 0.3	30025	63	86. 5	2
3	84 11.4	28652	68	85. 0	84 1.0	29926	63	84. 8	3
4	82 16.1	28525	68	83. 4	82 2.3	29787	64	83. 1	4
5	80 21.6	28363	69	81. 7	80 4.5	29615	64	81. 4	5
6	78 28.0	28169	69	80. 1	78 7.7	29402	65	79. 7	6
7	76 35.5	27941	70	78. 5	76 12.2	29156	66	78. 1	7
8	74 44.2	27680	71	77. 0	74 18.0	28877	67	76. 4	8
9	72 54.4	27392	72	75. 4	72 25.4	28565	68	74. 8	9
10	71 6.1	27074	74	73. 9	70 34.5	28222	69	73. 3	10
11	69 19.4	26730	75	72. 4	68 45.4	27851	71	71. 7	11
12	67 34.4	26360	77	70. 9	66 58.1	27456	72	70. 2	12
13	65 51.3	25968	78	69. 5	65 12.9	27034	74	68. 7	13
14	64 10.1	25555	80	68. 1	63 29.8	26590	76	67. 3	14
15	62 30.9	25120	82	66. 7	61 48.8	26126	78	65. 9	15
16	60 53.6	24669	84	65. 4	60 10.0	25644	80	64. 5	16
17	59 18.4	24202	86	64. 1	58 33.3	25147	82	63. 1	17
18	57 45.2	23720	89	62. 8	56 59.0	24632	84	61. 8	18
19	56 14.1	23227	91	61. 6	55 26.8	24107	87	60. 6	19
20	54 45.1	22722	94	60. 4	53 56.9	23571	89	59. 4	20
21	53 18.1	22208	97	59. 2	52 29.1	23026	92	58. 2	21
22	51 53.2	21686	100	58. 1	51 3.6	22474	95	57. 0	22
23	50 30.4	21159	103	57. 0	49 40.2	21915	98	55. 9	23
24	49 9.5	20625	106	55. 9	48 19.0	21352	102	54. 8	24
25	47 50.6	20088	110	54. 9	46 59.8	20786	105	53. 8	25
26	46 33.6	19550	113	53. 9	45 42.7	20218	109	52. 8	26
27	45 18.5	19008	117	52. 9	44 27.6	19651	113	51. 8	27
28	44 5.3	18469	121	52. 0	43 14.4	19082	117	50. 9	28
29	42 53.8	17927	125	51. 1	42 3.1	18516	121	50. 0	29
30	41 44.1	17390	129	50. 2	40 53.6	17951	125	49. 1	30
31	40 36.1	16854	134	49. 4	39 45.9	17390	129	48. 3	31
32	39 29.8	16321	139	48. 6	38 39.9	16834	134	47. 5	32
33	38 25.1	15793	143	47. 8	37 35.6	16281	139	46. 7	33
34	37 21.9	15268	148	47. 1	36 32.9	15734	144	45. 9	34
35	36 20.2	14750	154	46. 3	35 31.8	15194	149	45. 2	35
36	35 19.9	14238	159	45. 6	34 32.1	14660	155	44. 5	36
37	34 21.1	13730	165	45. 0	33 33.9	14131	160	43. 8	37
38	33 23.6	13230	170	44. 3	32 37.1	13612	166	43. 2	38
39	32 27.4	12736	176	43. 7	31 41.6	13099	172	42. 5	39
40	31 32.5	12251	183	43. 1	30 47.4	12595	178	41. 9	40
41	30 38.8	11772	189	42. 5	29 54.4	12099	185	41. 3	41
42	29 46.2	11302	196	41. 9	29 2.6	11612	191	40. 8	42
43	28 54.7	10841	203	41. 4	28 12.0	11135	198	40. 3	43
44	28 4.4	10387	210	40. 9	27 22.4	10666	206	39. 7	44
45	27 15.0	9942	217	40. 4	26 33.9	10206	213	39. 2	45
46	26 26.7	9507	225	39. 9	25 46.4	9756	221	38. 8	46
47	25 39.2	9080	233	39. 4	24 59.9	9316	229	38. 3	47
48	24 52.7	8663	241	39. 0	24 14.2	8885	237	37. 8	48
49	24 7.1	8255	250	38. 5	23 29.5	8465	246	37. 4	49
50	23 22.3	7856	259	38. 1	22 45.6	8053	254	37. 0	50
51	22 38.4	7468	268	37. 7	22 2.6	7653	264	36. 6	51
52	21 55.2	7088	277	37. 3	21 20.3	7263	273	36. 2	52
53	21 12.7	6718	287	37. 0	20 38.7	6882	283	35. 9	53
54	20 30.9	6358	298	36. 6	19 57.9	6513	293	35. 5	54
55	19 49.9	6008	308	36. 3	19 17.7	6153	304	35. 2	55
56	19 9.4	5668	319	35. 9	18 38.2	5803	315	34. 9	56
57	18 29.6	5338	331	35. 6	17 59.3	5464	326	34. 5	57
58	17 50.4	5018	343	35. 3	17 21.0	5136	338	34. 2	58
59	17 11.7	4708	355	35. 0	16 43.3	4818	351	34. 0	59
60	16 33.6	4407	368	34. 8	16 6.1	4509	364	33. 7	60
61	15 56.0	4117	381	34. 5	15 29.5	4211	377	33. 4	61
62	15 18.9	3836	395	34. 2	14 53.3	3923	391	33. 2	62
63	14 42.3	3566	410	34. 0	14 17.6	3647	405	32. 9	63
64	14 6.1	3306	425	33. 8	13 42.3	3380	421	32. 7	64
65	13 30.3	3054	441	33. 5	13 7.5	3122	437	32. 5	65

Table II

Explanation of the Construction and Use of Tables

t° / L°	61° b	61° A	61° C	61° Z′	62° b	62° A	62° C	62° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	31443	58	90. 0	90 0.0	32839	54	90. 0	0
1	87 56.3	31422	58	88. 2	87 52.2	32815	54	88. 1	1
2	85 52.8	31356	58	86. 4	85 44.8	32746	54	86. 2	2
3	83 49.8	31249	59	84. 6	83 37.8	32631	55	84. 4	3
4	81 47.6	31103	59	82. 8	81 31.7	32468	55	82. 5	4
5	79 46.2	30912	60	81. 1	79 26.6	32264	56	80. 7	5
6	77 46.1	30684	61	79. 3	77 22.8	32015	56	78. 9	6
7	75 47.3	30418	61	77. 6	75 20.6	31726	57	77. 1	7
8	73 50.0	30116	62	75. 9	73 20.1	31399	58	75. 3	8
9	71 54.5	29778	64	74. 2	71 21.4	31037	59	73. 6	9
10	70 0.8	29410	65	72. 6	69 24.9	30639	61	71. 9	10
11	68 9.1	29012	66	71. 0	67 30.5	30209	62	70. 3	11
12	66 19.5	28584	68	69. 4	65 38.5	29750	64	68. 6	12
13	64 32.2	28132	69	67. 9	63 48.8	29263	65	67. 1	13
14	62 47.0	27656	71	66. 4	62 1.7	28753	67	65. 5	14
15	61 4.3	27159	73	65. 0	60 17.1	28222	69	64. 0	15
16	59 23.8	26645	75	63. 6	58 35.0	27670	71	62. 6	16
17	57 45.8	26112	78	62. 2	56 55.6	27104	73	61. 2	17
18	56 10.2	25566	80	60. 9	55 18.8	26520	76	59. 8	18
19	54 37.0	25007	83	59. 6	53 44.5	25926	78	58. 5	19
20	53 6.2	24438	85	58. 3	52 12.9	25321	81	57. 2	20
21	51 37.7	23859	88	57. 1	50 43.7	24708	84	56. 0	21
22	50 11.6	23274	91	55. 9	49 17.1	24087	87	54. 8	22
23	48 47.8	22683	94	54. 8	47 52.9	23463	90	53. 7	23
24	47 26.2	22089	97	53. 7	46 31.1	22836	93	52. 6	24
25	46 6.9	21493	101	52. 7	45 11.6	22207	97	51. 5	25
26	44 49.7	20895	105	51. 7	43 54.4	21577	100	50. 5	26
27	43 34.6	20296	108	50. 7	42 39.4	20950	104	49. 5	27
28	42 21.5	19700	112	49. 7	41 26.6	20322	108	48. 6	28
29	41 10.4	19106	116	48. 8	40 15.8	19700	112	47. 6	29
30	40 1.2	18516	121	47. 9	39 7.0	19082	117	46. 8	30
31	38 53.9	17927	125	47. 1	38 0.1	18469	121	45. 9	31
32	37 48.4	17347	130	46. 3	36 55.1	17860	126	45. 1	32
33	36 44.6	16770	135	45. 5	35 51.8	17259	130	44. 3	33
34	35 42.4	16200	140	44. 7	34 50.3	16665	136	43. 6	34
35	34 41.9	15636	145	44. 0	33 50.4	16080	141	42. 8	35
36	33 42.9	15081	150	43. 3	32 52.2	15501	146	42. 1	36
37	32 45.3	14532	156	42. 6	31 55.4	14931	152	41. 5	37
38	31 49.2	13993	162	42. 0	31 0.1	14371	158	40. 8	38
39	30 54.5	13460	168	41. 4	30 6.2	13820	164	40. 2	39
40	30 1.1	12938	174	40. 8	29 13.6	13280	170	39. 6	40
41	29 8.9	12425	180	40. 2	28 22.3	12747	176	39. 0	41
42	28 18.0	11921	187	39. 6	27 32.3	12228	183	38. 5	42
43	27 28.2	11427	194	39. 1	26 43.4	11716	190	37. 9	43
44	26 39.5	10942	201	38. 6	25 55.6	11215	197	37. 4	44
45	25 51.9	10468	209	38. 1	25 8.9	10726	205	36. 9	45
46	25 5.3	10003	216	37. 6	24 23.3	10248	212	36. 5	46
47	24 19.6	9549	224	37. 2	23 38.6	9780	220	36. 0	47
48	23 34.9	9106	233	36. 7	22 54.9	9323	229	35. 6	48
49	22 51.1	8672	241	36. 3	22 12.0	8876	237	35. 2	49
50	22 8.2	8249	250	35. 9	21 30.1	8442	246	34. 8	50
51	21 26.1	7837	259	35. 5	20 48.9	8018	255	34. 4	51
52	20 44.7	7435	269	35. 1	20 8.6	7606	265	34. 0	52
53	20 4.1	7045	279	34. 8	19 28.9	7204	275	33. 7	53
54	19 24.2	6664	289	34. 6	18 50.0	6814	285	33. 3	54
55	18 45.0	6295	300	34. 1	18 11.8	6435	295	33. 0	55
56	18 6.5	5937	311	33. 8	17 34.3	6067	307	32. 7	56
57	17 28.6	5588	322	33. 5	16 57.3	5711	319	32. 6	57
58	16 51.2	5252	334	33. 2	16 21.0	5365	331	32. 1	58
59	16 14.5	4925	346	32. 9	15 45.2	5031	342	31. 8	59
60	15 38.2	4608	359	32. 6	15 9.9	4708	355	31. 5	60
61	15 2.5	4304	373	32. 4	14 35.2	4395	368	31. 3	61
62	14 27.3	4009	387	32. 1	14 1.0	4094	382	31. 1	62
63	13 52.5	3726	401	31. 9	13 27.2	3804	397	30. 8	63
64	13 18.2	3453	416	31. 7	12 53.8	3525	412	30. 6	64
65	12 44.3	3190	432	31. 5	12 20.9	3256	428	30. 4	65

L° \ t°	63° b	63° A	63° C	63° Z′	64° b	64° A	64° C	64° Z′	L° \ t°
	° ′			°	° ′			°	
0	90 0.0	34295	50	90.0	90 0.0	35816	46	90.0	0
1	87 47.9	34271	50	88.0	87 43.2	35787	46	88.0	1
2	85 36.1	34194	50	86.1	85 26.7	35705	47	85.9	2
3	83 24.9	34067	51	84.1	83 11.0	35568	47	83.9	3
4	81 14.6	33891	51	82.2	80 56.2	35376	47	81.9	4
5	79 5.5	33669	52	80.3	78 42.8	35133	48	79.9	5
6	76 57.9	33400	53	78.4	76 31.0	34840	49	77.9	6
7	74 52.0	33088	53	76.5	74 21.2	34502	50	76.0	7
8	72 47.9	32732	54	74.7	72 13.5	34117	50	74.1	8
9	70 46.1	32339	56	72.9	70 8.1	33688	52	72.2	9
10	68 46.4	31909	57	71.2	68 5.3	33223	53	70.4	10
11	66 49.3	31445	58	69.5	66 5.2	32722	54	68.6	11
12	64 54.7	30952	60	67.8	64 7.8	32189	56	66.9	12
13	63 2.7	30429	61	66.2	62 13.6	31628	58	65.2	13
14	61 13.5	29880	63	64.6	60 22.2	31039	59	63.6	14
15	59 27.0	29312	65	63.1	58 33.9	30429	61	62.0	15
16	57 43.4	28721	67	61.6	56 48.6	29798	64	60.5	16
17	56 2.6	28115	70	60.2	55 6.4	29150	66	59.1	17
18	54 24.5	27494	72	58.8	53 27.3	28487	68	57.6	18
19	52 49.3	26862	74	57.4	51 51.1	27814	71	56.3	19
20	51 16.8	26219	77	56.1	50 17.9	27131	73	55.0	20
21	49 47.1	25568	80	54.9	48 47.5	26442	76	53.7	21
22	48 20.0	24913	83	53.7	47 20.1	25746	79	52.5	22
23	46 55.5	24251	86	52.5	45 55.4	25050	82	51.3	23
24	45 33.5	23591	89	51.4	44 33.3	24351	86	50.2	24
25	44 14.0	22927	93	50.3	43 13.9	23654	89	49.1	25
26	42 56.9	22266	96	49.3	41 56.9	22959	93	48.1	26
27	41 42.1	21607	100	48.3	40 42.4	22266	96	47.1	27
28	40 29.5	20950	104	47.3	39 30.2	21577	100	46.1	28
29	39 19.1	20296	108	46.4	38 20.3	20895	105	45.2	29
30	38 10.8	19651	113	45.5	37 12.5	20218	109	44.3	30
31	37 4.4	19008	117	44.7	36 6.8	19550	113	43.4	31
32	36 0.0	18376	122	43.9	35 3.1	18888	118	42.6	32
33	34 57.4	17748	127	43.1	34 1.2	18236	123	41.8	33
34	33 56.6	17129	132	42.3	33 1.2	17593	128	41.1	34
35	32 57.5	16521	137	41.6	32 2.9	16960	133	40.4	35
36	32 0.0	15920	142	40.9	31 6.3	16337	138	39.7	36
37	31 4.1	15330	148	40.3	30 11.3	15723	144	39.0	37
38	30 9.6	14749	154	39.6	29 17.8	15123	150	38.4	38
39	29 16.6	14178	160	39.0	28 25.7	14532	156	37.8	39
40	28 24.9	13618	166	38.4	27 35.0	13954	162	37.2	40
41	27 34.6	13069	172	37.8	26 45.7	13385	169	36.6	41
42	26 45.5	12530	179	37.3	25 57.6	12831	175	36.1	42
43	25 57.5	12003	186	36.8	25 10.7	12286	182	35.6	43
44	25 10.8	11486	193	36.3	24 24.9	11755	189	35.1	44
45	24 25.1	10982	201	35.8	23 40.3	11234	197	34.6	45
46	23 40.4	10489	208	35.3	22 56.7	10727	205	34.1	46
47	22 56.7	10008	216	34.9	22 14.1	10232	212	33.7	47
48	22 14.0	9537	225	34.4	21 32.4	9749	221	33.3	48
49	21 32.2	9079	233	34.0	20 51.6	9278	229	32.9	49
50	20 51.2	8631	242	33.6	20 11.7	8820	238	32.5	50
51	20 11.1	8197	251	33.3	19 32.6	8373	247	32.1	51
52	19 31.8	7774	261	32.9	18 54.4	7938	257	31.8	52
53	18 53.2	7362	271	32.5	18 16.8	7516	267	31.4	53
54	18 15.3	6961	282	32.2	17 40.0	7106	277	31.1	54
55	17 38.1	6574	292	31.9	17 3.8	6709	288	30.8	55
56	17 1.5	6196	302	31.6	16 28.3	6322	299	30.5	56
57	16 25.6	5831	314	31.3	15 53.4	5949	310	30.2	57
58	15 50.3	5477	326	31.0	15 19.1	5587	322	29.9	58
59	15 15.5	5135	338	30.7	14 45.4	5236	335	29.6	59
60	14 41.2	4804	351	30.5	14 12.2	4899	347	29.4	60
61	14 7.5	4485	365	30.2	13 39.5	4573	361	29.1	61
62	13 34.3	4176	379	30.0	13 7.2	4258	375	28.9	62
63	13 1.5	3880	393	29.8	12 35.5	3955	389	28.7	63
64	12 29.1	3595	408	29.5	12 4.1	3663	405	28.5	64
65	11 57.2	3320	424	29.3	11 33.2	3384	420	28.3	65

L° \ t°	65° b	65° A	65° C	65° Z′	66° b	66° A	66° C	66° Z′	L° \ t°
	° ′			°	° ′			°	
0	90 0.0	37405	43	90. 0	90 0.0	39069	39	90. 0	0
1	87 38.1	37375	43	87. 9	87 32.6	39034	39	87. 8	1
2	85 16.6	37283	43	85. 7	85 5.6	38935	40	85. 5	2
3	82 55.9	37132	43	83. 6	82 39.5	38769	40	83. 3	3
4	80 36.3	36924	44	81. 5	80 14.7	38542	40	81. 1	4
5	78 18.2	36660	44	79. 4	77 51.6	38252	41	78. 9	5
6	76 2.0	36341	45	77. 4	75 30.7	37904	42	76. 8	6
7	73 48.0	35972	46	75. 4	73 12.1	37501	43	74. 7	7
8	71 36.3	35552	47	73. 4	70 56.3	37044	44	72. 6	8
9	69 27.3	35091	48	71. 5	68 43.4	36541	45	70. 6	9
10	67 21.2	34584	49	69. 6	66 33.7	35995	46	68. 7	10
11	65 18.0	34043	51	67. 7	64 27.4	35407	47	66. 8	11
12	63 18.0	33468	52	66. 0	62 24.5	34785	49	65. 0	12
13	61 21.2	32863	54	64. 2	60 25.2	34132	51	63. 2	13
14	59 27.7	32229	56	62. 6	58 29.5	33450	52	61. 5	14
15	57 37.5	31573	58	61. 0	56 37.4	32746	54	59. 8	15
16	55 50.6	30898	60	59. 4	54 49.0	32023	56	58. 2	16
17	54 7.0	30206	62	57. 9	53 4.1	31284	59	56. 7	17
18	52 26.8	29500	65	56. 5	51 22.8	30530	61	55. 2	18
19	50 49.7	28782	67	55. 1	49 45.0	29768	64	53. 8	19
20	49 15.8	28058	70	53. 7	48 10.6	28998	66	52. 5	20
21	47 45.1	27327	73	52. 5	46 39.4	28222	69	51. 2	21
22	46 17.3	26592	76	51. 2	45 11.5	27446	72	49. 9	22
23	44 52.5	25855	79	50. 0	43 46.6	26669	75	48. 7	23
24	43 30.5	25119	82	48. 9	42 24.8	25891	79	47. 6	24
25	42 11.2	24385	85	47. 8	41 5.8	25119	82	46. 5	25
26	40 54.5	23654	89	46. 8	39 49.6	24351	86	45. 4	26
27	39 40.4	22927	93	45. 8	38 35.9	23591	89	44. 4	27
28	38 28.7	22207	97	44. 8	37 24.9	22836	93	43. 5	28
29	37 19.4	21493	101	43. 9	36 16.2	22089	97	42. 6	29
30	36 12.2	20786	105	43. 0	35 9.9	21352	102	41. 7	30
31	35 7.2	20088	110	42. 2	34 5.7	20625	106	40. 8	31
32	34 4.3	19401	114	41. 3	33 3.6	19907	111	40. 0	32
33	33 3.3	18720	119	40. 6	32 3.6	19202	116	39. 3	33
34	32 4.2	18052	124	39. 8	31 5.4	18509	121	38. 5	34
35	31 6.8	17396	129	39. 1	30 9.1	17827	126	37. 8	35
36	30 11.2	16750	135	38. 4	29 14.5	17159	131	37. 1	36
37	29 17.1	16116	140	37. 8	28 21.5	16501	137	36. 5	37
38	28 24.6	15493	146	37. 2	27 30.1	15858	143	35. 9	38
39	27 33.6	14882	152	36. 5	26 40.2	15228	149	35. 3	39
40	26 43.9	14284	158	36. 0	25 51.6	14610	155	34. 7	40
41	25 55.6	13699	165	35. 4	25 4.5	14008	161	34. 2	41
42	25 8.6	13124	172	34. 9	24 18.6	13416	168	33. 6	42
43	24 22.8	12566	179	34. 4	23 33.9	12839	175	33. 1	43
44	23 38.1	12018	186	33. 9	22 50.4	12277	182	32. 7	44
45	22 54.6	11482	193	33. 4	22 8.0	11727	190	32. 2	45
46	22 12.1	10961	201	33. 0	21 26.6	11191	198	31. 8	46
47	21 30.6	10453	209	32. 5	20 46.3	10669	205	31. 3	47
48	20 50.0	9956	217	32. 1	20 6.8	10160	214	30. 9	48
49	20 10.3	9473	226	31. 7	19 28.3	9665	222	30. 5	49
50	19 31.5	9003	235	31. 3	18 50.7	9182	231	30. 2	50
51	18 53.5	8544	244	31. 0	18 13.8	8713	240	29. 8	51
52	18 16.3	8100	253	30. 6	17 37.7	8258	250	29. 5	52
53	17 39.9	7667	263	30. 3	17 2.4	7815	260	29. 1	53
54	17 4.1	7247	274	30. 0	16 27.8	7387	270	28. 8	54
55	16 29.1	6841	284	29. 7	15 53.8	6970	281	28. 5	55
56	15 54.6	6447	295	29. 4	15 20.5	6566	292	28. 2	56
57	15 20.8	6064	307	29. 1	14 47.8	6176	303	28. 0	57
58	14 47.6	5694	319	28. 8	14 15.6	5798	315	27. 7	58
59	14 14.9	5336	331	28. 5	13 44.0	5433	327	27. 4	59
60	13 42.7	4991	344	28. 3	13 12.9	5082	340	27. 2	60
61	13 11.1	4658	357	28. 1	12 42.3	4741	354	27. 0	61
62	12 39.9	4337	371	27. 8	12 12.2	4414	367	26. 8	62
63	12 9.1	4028	385	27. 6	11 42.5	4099	382	26. 6	63
64	11 38.8	3730	401	27. 4	11 13.2	3796	397	26. 4	64
65	11 8.9	3446	417	27. 2	10 44.4	3505	413	26. 2	65

t° / L°	67° b	67° A	67° C	67° Z′	68° b	68° A	68° C	68° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	40812	36	90. 0	90 0.0	42642	33	90. 0	0
1	87 26.5	40776	36	87. 6	87 19.9	42601	33	87. 5	1
2	84 53.6	40667	36	85. 3	84 40.5	42479	33	85. 1	2
3	82 21.6	40483	37	83. 0	82 2.2	42281	33	82. 6	3
4	79 51.2	40234	37	80. 7	79 25.6	42004	34	80. 2	4
5	77 22.7	39916	38	78. 4	76 51.3	41655	34	77. 8	5
6	74 56.7	39535	38	76. 2	74 19.6	41234	35	75. 5	6
7	72 33.3	39092	39	74. 0	71 51.1	40753	36	73. 2	7
8	70 13.0	38595	40	71. 8	69 26.1	40207	37	71. 0	8
9	67 56.1	38048	41	69. 8	67 4.9	39609	38	68. 8	9
10	65 42.7	37451	43	67. 8	64 47.6	38961	39	66. 7	10
11	63 33.0	36817	44	65. 8	62 34.5	38272	41	64. 7	11
12	61 27.2	36144	46	63. 9	60 25.7	37541	42	62. 8	12
13	59 25.4	35437	47	62. 1	58 21.3	36779	44	60. 9	13
14	57 27.5	34704	49	60. 3	56 21.2	35990	46	59. 1	14
15	55 33.5	33947	51	58. 6	54 25.5	35177	48	57. 4	15
16	53 43.6	33173	53	57. 0	52 34.0	34345	50	55. 7	16
17	51 57.5	32381	55	55. 4	50 46.8	33497	52	54. 1	17
18	50 15.2	31578	58	53. 9	49 3.8	32640	55	52. 6	18
19	48 36.7	30766	60	52. 5	47 24.7	31777	57	51. 1	19
20	47 1.8	29948	63	51. 1	45 49.5	30909	60	49. 8	20
21	45 30.5	29127	66	49. 8	44 18.0	30039	63	48. 4	21
22	44 2.5	28305	69	48. 6	42 50.2	29171	66	47. 2	22
23	42 37.8	27484	72	47. 4	41 25.7	28305	69	46. 0	23
24	41 16.2	26669	75	46. 2	40 4.6	27446	72	44. 8	24
25	39 57.6	25855	79	45. 1	38 46.6	26592	76	43. 7	25
26	38 41.9	25050	82	44. 1	37 31.6	25746	79	42. 7	26
27	37 29.0	24251	86	43. 1	36 19.4	24913	83	41. 7	27
28	36 18.6	23463	90	42. 1	35 10.0	24087	87	40. 7	28
29	35 10.8	22683	94	41. 2	34 3.1	23274	91	39. 8	29
30	34 5.3	21915	98	40. 3	32 58.6	22474	95	38. 9	30
31	33 2.1	21159	103	39. 5	31 56.5	21686	100	38. 1	31
32	32 1.1	20413	108	38. 7	30 56.5	20911	104	37. 3	32
33	31 2.1	19680	112	37. 9	29 58.7	20152	109	36. 6	33
34	30 5.0	18960	117	37. 2	29 2.8	19407	114	35. 8	34
35	29 9.7	18255	123	36. 5	28 8.8	18675	119	35. 2	35
36	28 16.3	17561	128	35. 8	27 16.5	17959	125	34. 5	36
37	27 24.5	16883	134	35. 2	26 26.0	17259	130	33. 9	37
38	26 34.2	16219	139	34. 6	25 37.0	16573	136	33. 3	38
39	25 45.5	15568	145	34. 0	24 49.5	15902	142	32. 7	39
40	24 58.2	14932	152	33. 4	24 3.5	15247	149	32. 2	40
41	24 12.2	14311	158	32. 9	23 18.8	14606	155	31. 6	41
42	23 27.5	13702	165	32. 4	22 35.4	13982	162	31. 1	42
43	22 44.0	13109	172	31. 9	21 53.2	13373	169	30. 6	43
44	22 1.7	12531	179	31. 4	21 12.1	12779	176	30. 2	44
45	21 20.5	11965	187	31. 0	20 32.2	12200	183	29. 7	45
46	20 40.4	11416	194	30. 5	19 53.3	11636	191	29. 3	46
47	20 1.2	10880	202	30. 1	19 15.3	11087	199	28. 9	47
48	19 23.0	10359	210	29. 7	18 38.3	10553	207	28. 5	48
49	18 45.6	9851	219	29. 4	18 2.2	10033	216	28. 2	49
50	18 9.1	9358	228	29. 0	17 27.0	9529	225	27. 8	50
51	17 33.5	8878	237	28. 6	16 52.5	9038	234	27. 5	51
52	16 58.6	8412	247	28. 3	16 18.8	8562	243	27. 1	52
53	16 24.4	7959	257	28. 0	15 45.8	8100	253	26. 8	53
54	15 50.9	7520	267	27. 7	15 13.5	7652	264	26. 5	54
55	15 18.1	7096	277	27. 4	14 41.9	7219	274	26. 3	55
56	14 45.9	6684	288	27. 1	14 10.8	6799	285	26. 0	56
57	14 14.3	6285	300	26. 8	13 40.4	6392	297	25. 7	57
58	13 43.2	5900	312	26. 6	13 10.5	6000	309	25. 5	58
59	13 12.7	5528	324	26. 3	12 41.1	5620	321	25. 2	59
60	12 42.7	5169	337	26. 1	12 12.2	5254	334	25. 0	60
61	12 13.2	4823	350	25. 9	11 43.8	4901	347	24. 8	61
62	11 44.2	4488	364	25. 7	11 15.9	4561	361	24. 6	62
63	11 15.6	4168	379	25. 5	10 48.4	4234	376	24. 4	63
64	10 47.4	3859	394	25. 3	10 21.3	3921	391	24. 2	64
65	10 19.6	3563	410	25. 1	9 54.5	3620	407	24. 0	65

Table II

Explanation of the Construction and Use of Tables

t° / L°	69° b	69° A	69° C	69° Z′	70° b	70° A	70° C	70° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	44567	30	90. 0	90 0.0	46595	27	90. 0	0
1	87 12.7	44521	30	87. 4	87 4.7	46545	27	87. 3	1
2	84 26.1	44388	30	84. 8	84 10.2	46397	27	84. 5	2
3	81 40.8	44168	30	82. 2	81 17.3	46149	28	81. 8	3
4	78 57.5	43863	31	79. 7	78 26.7	45812	28	79. 2	4
5	76 16.8	43477	32	77. 2	75 39.1	45385	29	76. 5	5
6	73 39.3	43014	32	74. 8	72 55.1	44874	29	74. 0	6
7	71 5.2	42482	33	72. 4	70 15.1	44288	30	71. 5	7
8	68 35.2	41884	34	70. 1	67 39.7	43631	31	69. 1	8
9	66 9.4	41231	35	67. 8	65 9.1	42912	32	66. 7	9
10	63 48.1	40525	36	65. 7	62 43.6	42142	34	64. 5	10
11	61 31.5	39773	38	63. 6	60 23.4	41322	35	62. 3	11
12	59 19.6	38980	39	61. 6	58 8.4	40463	37	60. 3	12
13	57 12.6	38155	41	59. 6	55 58.8	39569	38	58. 3	13
14	55 10.3	37305	43	57. 8	53 54.5	38649	40	56. 4	14
15	53 12.9	36430	45	56. 0	51 55.4	37710	42	54. 6	15
16	51 20.1	35537	47	54. 3	50 1.4	36753	44	52. 9	16
17	49 31.9	34632	49	52. 7	48 12.4	35782	46	51. 2	17
18	47 48.2	33717	52	51. 2	46 28.1	34808	49	49. 7	18
19	46 8.7	32799	54	49. 7	44 48.4	33829	51	48. 2	19
20	44 33.3	31879	57	48. 3	43 13.2	32851	54	46. 8	20
21	43 2.0	30956	60	47. 0	41 42.1	31877	57	45. 4	21
22	41 34.4	30039	63	45. 7	40 14.9	30909	60	44. 2	22
23	40 10.4	29127	66	44. 5	38 51.6	29947	63	43. 0	23
24	38 49.9	28222	69	43. 3	37 31.9	28998	66	41. 8	24
25	37 32.6	27328	73	42. 2	36 15.5	28058	70	40. 7	25
26	36 18.4	26442	76	41. 2	35 2.4	27131	73	39. 7	26
27	35 7.2	25568	80	40. 2	33 52.3	26219	77	38. 7	27
28	33 58.8	24708	84	39. 3	32 45.1	25321	81	37. 8	28
29	32 53.0	23859	88	38. 4	31 40.5	24438	85	36. 9	29
30	31 49.7	23026	92	37. 5	30 38.5	23571	89	36. 1	30
31	30 48.8	22208	97	36. 7	29 39.0	22722	94	35. 2	31
32	29 50.1	21404	101	35. 9	28 41.6	21889	99	34. 5	32
33	28 53.5	20617	106	35. 2	27 46.5	21074	103	33. 8	33
34	27 58.9	19845	111	34. 5	26 53.3	20275	108	33. 1	34
35	27 6.2	19089	116	33. 8	26 2.0	19495	114	32. 4	35
36	26 15.3	18349	122	33. 1	25 12.5	18732	119	31. 8	36
37	25 26.1	17627	128	32. 5	24 24.7	17987	125	31. 2	37
38	24 38.4	16919	133	31. 9	23 38.5	17259	130	30. 6	38
39	23 52.3	16230	139	31. 4	22 53.8	16549	137	30. 0	39
40	23 7.6	15555	146	30. 9	22 10.6	15856	143	29. 5	40
41	22 24.2	14897	152	30. 3	21 28.6	15181	149	29. 0	41
42	21 42.2	14256	159	29. 8	20 48.0	14522	156	28. 5	42
43	21 1.3	13631	166	29. 4	20 8.5	13882	163	28. 1	43
44	20 21.6	13021	173	28. 9	19 30.2	13256	170	27. 7	44
45	19 43.0	12428	180	28. 5	18 52.9	12650	178	27. 2	45
46	19 5.4	11851	188	28. 1	18 16.7	12058	185	26. 8	46
47	18 28.7	11288	196	27. 7	17 41.4	11483	193	26. 5	47
48	17 53.0	10742	204	27. 3	17 7.0	10925	202	26. 1	48
49	17 18.2	10211	213	27. 0	16 33.5	10382	210	25. 7	49
50	16 44.2	9695	222	26. 6	16 0.8	9856	219	25. 4	50
51	16 11.0	9195	232	26. 3	15 28.8	9345	228	25. 1	51
52	15 38.5	8708	241	26. 0	14 57.6	8849	238	24. 8	52
53	15 6.7	8237	250	25. 7	14 27.1	8369	248	24. 5	53
54	14 35.6	7781	261	25. 4	13 57.3	7904	258	24. 2	54
55	14 5.2	7338	271	25. 1	13 28.1	7452	268	24. 0	55
56	13 35.3	6910	282	24. 8	12 59.4	7017	279	23. 7	56
57	13 6.1	6495	294	24. 6	12 31.4	6595	291	23. 5	57
58	12 37.3	6096	306	24. 4	12 3.8	6187	303	23. 2	58
59	12 9.1	5710	318	24. 1	11 36.8	5795	315	23. 0	59
60	11 41.4	5337	331	23. 9	11 10.2	5416	328	22. 8	60
61	11 14.1	4977	344	23. 7	10 44.1	5052	341	22. 6	61
62	10 47.3	4632	358	23. 5	10 18.4	4700	355	22. 4	62
63	10 20.9	4300	373	23. 3	9 53.1	4362	370	22. 2	63
64	9 54.9	3981	388	23. 1	9 28.2	4038	385	22. 0	64
65	9 29.2	3675	404	23. 0	9 3.7	3727	402	21. 9	65

t° / L°	71° b	71° A	71° C	71° Z′	72° b	72° A	72° C	72° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	48736	24	90. 0	90 0.0	51002	22	90. 0	0
1	86 55.9	48680	24	87. 1	86 46.0	50939	22	86. 9	1
2	83 52.7	48512	25	84. 2	83 33.2	50754	22	83. 9	2
3	80 51.3	48240	25	81. 4	80 22.5	50446	22	80. 9	3
4	77 52.7	47861	25	78. 5	77 15.0	50023	23	77. 9	4
5	74 57.5	47387	26	75. 8	74 11.5	49492	23	75. 0	5
6	72 6.5	46822	27	73. 1	71 12.9	48865	24	72. 2	6
7	69 20.2	46173	28	70. 5	68 19.8	48142	25	69. 4	7
8	66 39.1	45450	29	68. 0	65 32.6	47345	26	66. 8	8
9	64 3.5	44663	30	65. 6	62 51.8	46473	27	64. 3	9
10	61 33.6	43814	31	63. 2	60 17.4	45547	28	61. 9	10
11	59 9.6	42922	32	61. 0	57 49.7	44567	30	59. 6	11
12	56 51.6	41985	34	58. 9	55 28.7	43550	31	57. 4	12
13	54 39.5	41018	36	56. 8	53 14.2	42498	33	55. 3	13
14	52 33.3	40023	37	54. 9	51 6.1	41424	35	53. 3	14
15	50 32.7	39009	39	53. 1	49 4.3	40333	37	51. 5	15
16	48 37.7	37984	42	51. 3	47 8.5	39231	39	49. 7	16
17	46 48.0	36948	44	49. 7	45 18.4	38123	41	48. 0	17
18	45 3.4	35907	46	48. 1	43 33.8	37012	44	46. 4	18
19	43 23.8	34868	49	46. 6	41 54.4	35907	46	44. 9	19
20	41 48.7	33829	51	45. 2	40 19.9	34808	49	43. 5	20
21	40 18.1	32799	54	43. 9	38 50.1	33717	52	42. 2	21
22	38 51.7	31777	57	42. 6	37 24.6	32640	55	40. 9	22
23	37 29.3	30766	60	41. 4	36 3.3	31578	58	39. 7	23
24	36 10.5	29768	64	40. 3	34 45.8	30530	61	38. 6	24
25	34 55.3	28782	67	39. 2	33 31.9	29500	64	37. 6	25
26	33 43.4	27814	71	38. 1	32 21.4	28487	68	36. 5	26
27	32 34.6	26862	74	37. 2	31 14.2	27494	72	35. 6	27
28	31 28.8	25926	78	36. 3	30 9.8	26520	76	34. 7	28
29	30 25.6	25007	83	35. 4	29 8.3	25566	80	33. 8	29
30	29 25.1	24107	87	34. 6	28 9.4	24632	84	33. 0	30
31	28 27.0	23227	91	33. 8	27 13.0	23720	89	32. 2	31
32	27 31.2	22364	96	33. 0	26 18.8	22829	93	31. 5	32
33	26 37.6	21521	101	32. 3	25 26.8	21956	98	30. 8	33
34	25 45.9	20696	106	31. 6	24 36.9	21106	103	30. 2	34
35	24 56.2	19891	111	31. 0	23 48.8	20277	108	29. 5	35
36	24 8.2	19104	116	30. 4	23 2.5	19468	114	28. 9	36
37	23 22.0	18338	122	29. 8	22 17.9	18678	119	28. 4	37
38	22 37.3	17589	128	29. 2	21 34.8	17909	125	27. 8	38
39	21 54.1	16859	134	28. 7	20 53.2	17160	131	27. 3	39
40	21 12.4	16148	140	28. 2	20 13.0	16431	138	26. 8	40
41	20 31.9	15456	147	27. 7	19 34.2	15721	144	26. 3	41
42	19 52.7	14780	153	27. 2	18 56.5	15031	151	25. 9	42
43	19 14.7	14124	160	26. 8	18 20.0	14359	158	25. 5	43
44	18 38.0	13485	167	26. 4	17 44.7	13705	165	25. 1	44
45	18 2.0	12865	175	26. 0	17 10.3	13071	172	24. 7	45
46	17 27.2	12259	183	25. 6	16 37.0	12454	180	24. 3	46
47	16 53.3	11672	191	25. 2	16 4.5	11855	188	24. 0	47
48	16 20.3	11103	199	24. 9	15 32.9	11273	196	23. 6	48
49	15 48.1	10548	207	24. 5	15 2.2	10709	205	23. 3	49
50	15 16.8	10012	216	24. 2	14 32.2	10161	214	23. 0	50
51	14 46.2	9490	225	23. 9	14 2.9	9630	223	22. 7	51
52	14 16.3	8986	235	23. 6	13 34.4	9117	232	22. 4	52
53	13 47.1	8496	245	23. 3	13 6.5	8619	242	22. 1	53
54	13 18.5	8022	255	23. 1	12 39.2	8137	253	21. 9	54
55	12 50.5	7563	266	22. 8	12 12.6	7669	263	21. 6	55
56	12 23.1	7121	277	22. 6	11 46.4	7219	274	21. 4	56
57	11 56.3	6691	288	22. 3	11 20.8	6783	286	21. 2	57
58	11 30.0	6277	300	22. 1	10 55.7	6363	298	21. 0	58
59	11 4.1	5878	313	21. 9	10 31.1	5958	310	20. 8	59
60	10 38.7	5492	325	21. 7	10 6.9	5566	323	20. 6	60
61	10 13.8	5122	339	21. 5	9 43.2	5190	336	20. 4	61
62	9 49.3	4765	353	21. 3	9 19.8	4828	350	20. 2	62
63	9 25.1	4422	367	21. 1	8 56.9	4480	365	20. 0	63
64	9 1.4	4093	382	21. 0	8 34.3	4146	380	19. 9	64
65	8 37.9	3778	398	20. 8	8 12.0	3826	396	19. 7	65

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t° / L°	73° b	73° A	73° C	73° Z′	74° b	74° A	74° C	74° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	53406	19	90. 0	90 0.0	55966	17	90. 0	0
1	86 35.0	53336	19	86. 7	86 22.6	55887	17	86. 5	1
2	83 11.3	53126	20	83. 5	82 46.8	55646	17	83. 1	2
3	79 50.3	52779	20	80. 3	79 14.1	55254	18	79. 7	3
4	76 32.9	52206	20	77. 1	75 45.9	54717	18	76. 3	4
5	73 20.4	51708	21	74. 1	72 23.4	54048	18	73. 1	5
6	70 13.6	51006	22	71. 1	69 7.6	53258	20	70. 0	6
7	67 13.2	50205	23	68. 3	65 59.3	52362	20	67. 0	7
8	64 19.6	49316	24	65. 5	62 59.0	51373	21	64. 1	8
9	61 33.3	48356	25	62. 9	60 7.1	50308	23	61. 4	9
10	58 54.4	47335	26	60. 4	57 23.6	49183	24	58. 8	10
11	56 22.9	46263	27	58. 0	54 48.5	48005	25	56. 4	11
12	53 59.0	45151	29	55. 8	52 21.8	46794	27	54. 1	12
13	51 42.2	44012	31	53. 7	50 3.1	45551	28	51. 9	13
14	49 32.6	42850	32	51. 6	47 52.1	44294	30	49. 8	14
15	47 29.7	41673	34	49. 8	45 48.6	43026	32	47. 9	15
16	45 33.4	40489	37	48. 0	43 52.1	41756	34	46. 1	16
17	43 43.2	39302	39	46. 3	42 2.2	40489	37	44. 4	17
18	41 58.9	38123	41	44. 7	40 18.5	39231	39	42. 9	18
19	40 20.1	36948	44	43. 2	38 40.7	37984	41	41. 4	19
20	38 46.5	35782	46	41. 8	37 8.2	36753	44	40. 0	20
21	37 17.7	34632	49	40. 5	35 40.8	35537	47	38. 7	21
22	35 53.5	33499	52	39. 2	34 18.2	34345	50	37. 4	22
23	34 33.5	32381	55	38. 0	32 59.9	33173	53	36. 3	23
24	33 17.5	31284	59	36. 9	31 45.7	32023	56	35. 2	24
25	32 5.2	30207	62	35. 9	30 35.3	30898	60	34. 2	25
26	30 56.4	29150	66	34. 9	29 28.4	29798	64	33. 2	26
27	29 50.9	28115	70	34. 0	28 24.7	28721	67	32. 3	27
28	28 48.3	27102	73	33. 1	27 24.1	27670	71	31. 4	28
29	27 48.6	26112	78	32. 2	26 26.4	26645	75	30. 6	29
30	26 51.5	25147	82	31. 4	25 31.2	25646	80	29. 8	30
31	25 56.8	24202	86	30. 7	24 38.6	24669	84	29. 1	31
32	25 4.5	23281	91	30. 0	23 48.2	23718	89	28. 4	32
33	24 14.3	22381	96	29. 3	22 59.9	22791	94	27. 8	33
34	23 26.1	21505	101	28. 7	22 13.6	21890	99	27. 1	34
35	22 39.8	20651	106	28. 1	21 29.2	21012	104	26. 6	35
36	21 55.2	19820	111	27. 5	20 46.6	20158	109	26. 0	36
37	21 12.3	19008	117	26. 9	20 5.5	19328	115	25. 5	37
38	20 31.0	18220	123	26. 4	19 26.0	18519	121	25. 0	38
39	19 51.1	17452	129	25. 9	18 47.9	17732	127	24. 5	39
40	19 12.6	16704	135	25. 4	18 11.1	16969	133	24. 0	40
41	18 35.4	15979	142	25. 0	17 35.6	16226	139	23. 6	41
42	17 59.4	15272	148	24. 6	17 1.2	15503	146	23. 2	42
43	17 24.5	14586	155	24. 1	16 28.0	14802	153	22. 8	43
44	16 50.7	13919	162	23. 8	15 55.8	14122	160	22. 4	44
45	16 17.8	13270	170	23. 4	15 24.6	13461	168	22. 1	45
46	15 46.0	12641	178	23. 0	14 54.3	12820	175	21. 7	46
47	15 15.0	12029	186	22. 7	14 24.9	12198	183	21. 4	47
48	14 44.9	11437	194	22. 4	13 56.3	11595	192	21. 1	48
49	14 15.6	10863	203	22. 1	13 28.5	11010	200	20. 8	49
50	13 47.0	10306	211	21. 8	13 1.4	10443	209	20. 5	50
51	13 19.2	9765	221	21. 5	12 35.0	9894	218	20. 3	51
52	12 52.0	9242	230	21. 2	12 9.2	9362	228	20. 0	52
53	12 25.5	8736	240	20. 9	11 44.0	8848	238	19. 8	53
54	11 59.6	8246	250	20. 7	11 19.5	8351	248	19. 5	54
55	11 34.2	7773	261	20. 5	10 55.4	7869	259	19. 3	55
56	11 9.4	7315	272	20. 2	10 31.9	7404	270	19. 1	56
57	10 45.0	6871	283	20. 0	10 8.9	6956	281	18. 9	57
58	10 21.2	6445	295	19. 8	9 46.4	6523	293	18. 7	58
59	9 57.8	6033	308	19. 6	9 24.2	6106	305	18. 5	59
60	9 34.9	5637	320	19. 4	9 2.5	5704	318	18. 3	60
61	9 12.3	5255	334	19. 3	8 41.2	5317	332	18. 2	61
62	8 50.2	4888	348	19. 1	8 20.3	4945	346	18. 0	62
63	8 28.4	4535	362	18. 9	7 59.7	4588	360	17. 8	63
64	8 6.9	4197	378	18. 8	7 39.4	4245	375	17. 7	64
65	7 45.8	3873	393	18. 6	7 19.5	3917	391	17. 6	65

t° / L°	75° b	A	C	Z′	76° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	58700	15	90. 0	90 0.0	61632	13	90. 0	0
1	86 8.5	58606	15	86. 3	85 52.4	61525	13	86. 0	1
2	82 19.0	58334	15	82. 6	81 47.2	61209	13	82. 0	2
3	78 33.2	57887	16	78. 9	77 46.6	60696	14	78. 1	3
4	74 52.9	57278	16	75. 4	73 52.7	59994	14	74. 4	4
5	71 19.4	56516	17	72. 0	70 7.1	59127	15	70. 7	5
6	67 53.9	55624	17	68. 7	66 31.0	58115	16	67. 3	6
7	64 37.2	54619	18	65. 5	63 5.4	56979	16	64. 0	7
8	61 29.9	53514	19	62. 6	59 50.8	55743	17	60. 8	8
9	58 32.1	52330	20	59. 7	56 47.3	54424	18	57. 9	9
10	55 44.1	51088	22	57. 1	53 54.8	53044	20	55. 1	10
11	53 5.5	49792	23	54. 5	51 13.1	51621	21	52. 6	11
12	50 36.3	48465	25	52. 2	48 41.8	50171	23	50. 2	12
13	48 16.0	47116	26	50. 0	46 20.4	48699	24	47. 9	13
14	46 4.2	45754	28	47. 9	44 8.2	47225	26	45. 9	14
15	44 0.4	44389	30	46. 0	42 4.7	45754	28	43. 9	15
16	42 4.2	43026	32	44. 2	40 9.2	44294	30	42. 1	16
17	40 15.0	41673	34	42. 5	38 21.3	42850	33	40. 5	17
18	38 32.4	40333	37	40. 9	36 40.2	41424	35	38. 9	18
19	36 55.9	39009	39	39. 5	35 5.5	40023	37	37. 4	19
20	35 25.0	37707	42	38. 1	33 36.7	38649	40	36. 1	20
21	33 59.4	36430	45	36. 8	32 13.2	37305	43	34. 8	21
22	32 38.6	35177	48	35. 6	30 54.7	35990	46	33. 6	22
23	31 22.3	33947	51	34. 4	29 40.8	34704	49	32. 5	23
24	30 10.2	32746	54	33. 4	28 31.1	33450	52	31. 5	24
25	29 1.9	31573	58	32. 4	27 25.2	32229	56	30. 5	25
26	27 57.2	30429	61	31. 4	26 22.9	31039	59	29. 6	26
27	26 55.7	29312	65	30. 6	25 23.9	29880	63	28. 8	27
28	25 57.3	28222	69	29. 7	24 27.9	28753	67	28. 0	28
29	25 1.7	27159	73	28. 9	23 34.7	27656	71	27. 2	29
30	24 8.8	26126	78	28. 2	22 44.1	26590	76	26. 5	30
31	23 18.2	25120	82	27. 5	21 55.9	25555	80	25. 8	31
32	22 30.0	24141	87	26. 8	21 9.9	24547	85	25. 2	32
33	21 43.8	23188	91	26. 2	20 25.9	23568	90	24. 6	33
34	20 59.6	22261	97	25. 6	19 43.9	22616	95	24. 0	34
35	20 17.2	21360	102	25. 0	19 3.6	21692	100	23. 5	35
36	19 36.5	20484	107	24. 5	18 25.0	20795	105	23. 0	36
37	18 57.3	19632	113	24. 0	17 47.9	19923	111	22. 5	37
38	18 19.7	18805	119	23. 5	17 12.3	19077	117	22. 0	38
39	17 43.5	18001	125	23. 1	16 38.0	18257	123	21. 6	39
40	17 8.5	17220	131	22. 6	16 5.0	17459	129	21. 2	40
41	16 34.8	16461	137	22. 2	15 33.1	16686	135	20. 8	41
42	16 2.2	15724	144	21. 8	15 2.3	15936	142	20. 4	42
43	15 30.7	15010	151	21. 5	14 32.6	15208	149	20. 1	43
44	15 0.2	14317	158	21. 1	14 3.8	14501	156	19. 7	44
45	14 30.6	13644	166	20. 8	13 36.0	13816	164	19. 4	45
46	14 2.0	12991	173	20. 4	13 9.0	13153	171	19. 1	46
47	13 34.1	12357	181	20. 1	12 42.8	12510	179	18. 8	47
48	13 7.1	11744	190	19. 8	12 17.3	11886	188	18. 5	48
49	12 40.8	11149	198	19. 5	11 52.6	11282	196	18. 3	49
50	12 15.2	10573	207	19. 3	11 28.5	10698	205	18. 0	50
51	11 50.2	10017	216	19. 0	11 5.0	10132	214	17. 8	51
52	11 25.9	9477	226	18. 8	10 42.2	9584	224	17. 6	52
53	11 2.2	8954	236	18. 5	10 19.9	9055	234	17. 3	53
54	10 39.0	8449	246	18. 3	9 58.1	8543	244	17. 1	54
55	10 16.3	7961	256	18. 1	9 36.9	8049	255	16. 9	55
56	9 54.2	7491	267	17. 9	9 16.1	7572	266	16. 7	56
57	9 32.5	7036	279	17. 7	8 55.7	7112	277	16. 6	57
58	9 11.2	6597	291	17. 5	8 35.8	6667	289	16. 4	58
59	8 50.4	6174	303	17. 4	8 16.2	6240	301	16. 2	59
60	8 29.9	5767	316	17. 2	7 57.1	5827	314	16. 1	60
61	8 9.9	5376	329	17. 0	7 38.3	5431	328	15. 9	61
62	7 50.1	4999	343	16. 9	7 19.8	5050	342	15. 8	62
63	7 30.8	4638	358	16. 7	7 1.6	4684	356	15. 6	63
64	7 11.7	4291	373	16. 6	6 43.8	4334	371	15. 5	64
65	6 52.9	3958	389	16. 5	6 26.2	3998	387	15. 4	65

t° / L°	77° b	A	C	Z′	78° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	64791	11	90. 0	90 0.0	68212	10	90. 0	0
1	85 33.8	64664	11	85. 7	85 12.1	68063	10	85. 3	1
2	81 10.6	64302	12	81. 4	80 27.9	67633	10	80. 7	2
3	76 53.1	63700	12	77. 2	75 51.1	66936	10	76. 2	3
4	72 43.9	62893	12	73. 2	71 24.6	65991	11	71. 8	4
5	68 44.9	61898	13	69. 3	67 10.7	64837	11	67. 7	5
6	64 57.4	60740	14	65. 6	63 10.9	63509	12	63. 8	6
7	61 22.4	59453	15	62. 2	59 26.1	62040	13	60. 2	7
8	58 0.3	58060	16	58. 9	55 56.6	60463	14	56. 8	8
9	54 51.1	56588	17	55. 9	52 42.0	58815	15	53. 6	9
10	51 54.5	55056	18	53. 1	49 42.0	57110	16	50. 8	10
11	49 10.2	53486	19	50. 4	46 55.6	55380	18	48. 1	11
12	46 37.4	51895	21	48. 0	44 22.0	53635	19	45. 6	12
13	44 15.4	50296	23	45. 7	42 0.3	51895	21	43. 4	13
14	42 3.5	48699	24	43. 7	39 49.5	50171	23	41. 3	14
15	40 0.9	47116	26	41. 7	37 48.6	48464	25	39. 4	15
16	38 6.8	45551	28	39. 9	35 56.7	46794	27	37. 6	16
17	36 20.7	44012	31	38. 3	34 13.1	45151	29	36. 0	17
18	34 41.8	42498	33	36. 8	32 36.9	43550	31	34. 5	18
19	33 9.4	41018	36	35. 3	31 7.5	41985	34	33. 1	19
20	31 43.1	39569	38	34. 0	29 44.2	40463	37	31. 9	20
21	30 22.3	38155	41	32. 8	28 26.5	38980	39	30. 7	21
22	29 6.5	36780	44	31. 6	27 13.8	37541	42	29. 6	22
23	27 55.3	35437	47	30. 6	26 5.8	36144	46	28. 5	23
24	26 48.3	34132	51	29. 6	25 1.9	34785	49	27. 6	24
25	25 45.2	32863	54	28. 6	24 1.8	33468	52	26. 7	25
26	24 45.6	31628	58	27. 8	23 5.3	32189	56	25. 9	26
27	23 49.3	30429	61	27. 0	22 11.9	30952	60	25. 1	27
28	22 55.9	29263	65	26. 2	21 21.4	29750	64	24. 4	28
29	22 5.3	28132	69	25. 5	20 33.6	28584	68	23. 7	29
30	21 17.2	27034	74	24. 8	19 48.3	27456	72	23. 0	30
31	20 31.5	25968	78	24. 1	19 5.2	26360	77	22. 6	31
32	19 47.9	24933	83	23. 5	18 24.2	25298	81	21. 9	32
33	19 6.3	23929	88	23. 0	17 45.2	24269	86	21. 3	33
34	18 26.6	22953	93	22. 4	17 7.9	23274	91	20. 8	34
35	17 48.6	22008	98	21. 9	16 32.3	22306	96	20. 3	35
36	17 12.2	21090	103	21. 4	15 58.2	21368	102	19. 9	36
37	16 37.3	20201	109	21. 0	15 25.5	20460	107	19. 5	37
38	16 3.7	19337	115	20. 6	14 54.1	19578	113	19. 0	38
39	15 31.5	18498	121	20. 1	14 24.0	18726	119	18. 7	39
40	15 0.4	17685	127	19. 8	13 55.0	17899	125	18. 3	40
41	14 30.5	16898	134	19. 4	13 27.1	17098	132	18. 0	41
42	14 1.6	16134	140	19. 0	13 0.1	16321	139	17. 6	42
43	13 33.7	15394	147	18. 7	12 34.1	15569	145	17. 3	43
44	13 6.8	14676	154	18. 4	12 9.0	14839	153	17. 0	44
45	12 40.7	13980	162	18. 1	11 44.7	14132	160	16. 7	45
46	12 15.4	13305	170	17. 8	11 21.2	13448	168	16. 5	46
47	11 50.8	12652	178	17. 5	10 58.3	12786	176	16. 2	47
48	11 27.0	12020	186	17. 3	10 36.2	12144	184	16. 0	48
49	11 3.9	11407	194	17. 0	10 14.7	11524	193	15. 7	49
50	10 41.4	10814	203	16. 8	9 53.8	10923	202	15. 5	50
51	10 19.4	10241	212	16. 5	9 33.4	10343	211	15. 3	51
52	9 58.1	9687	222	16. 3	9 13.6	9783	220	15. 1	52
53	9 37.3	9150	232	16. 1	8 54.3	9239	230	14. 9	53
54	9 16.9	8631	242	15. 9	8 35.4	8714	240	14. 7	54
55	8 57.1	8132	253	15. 7	8 17.0	8208	251	14. 5	55
56	8 37.7	7649	264	15. 6	7 59.0	7720	262	14. 4	56
57	8 18.7	7183	275	15. 4	7 41.4	7248	273	14. 2	57
58	8 0.1	6733	287	15. 2	7 24.1	6795	285	14. 1	58
59	7 41.9	6300	299	15. 1	7 7.3	6357	298	13. 9	59
60	7 24.0	5883	312	14. 9	6 50.7	5937	311	13. 8	60
61	7 6.5	5483	326	14. 8	6 34.4	5531	324	13. 7	61
62	6 49.2	5098	340	14. 7	6 18.5	5143	338	13. 5	62
63	6 32.3	4729	354	14. 5	6 2.8	4769	353	13. 4	63
64	6 15.7	4374	369	14. 4	5 47.4	4412	368	13. 3	64
65	5 59.3	4035	385	14. 3	5 32.3	4070	384	13. 2	65

t° / L°	79° b	A	C	Z′	80° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	71940	8	90. 0	90 0.0	76033	7	90. 0	0
1	84 46.4	71765	8	84. 9	84 15.6	75819	7	84. 3	1
2	79 37.7	71250	8	79. 8	78 37.8	75196	7	78. 8	2
3	74 38.5	70421	9	74. 9	73 12.4	74197	7	73. 5	3
4	69 52.4	69308	9	70. 3	68 3.9	72874	8	68. 4	4
5	65 22.1	67962	10	65. 9	63 15.6	71287	8	63. 7	5
6	61 9.1	66426	10	61. 7	58 48.9	69491	9	59. 3	6
7	57 14.3	64742	11	57. 9	54 44.2	67551	10	55. 3	7
8	53 37.6	62956	12	54. 4	51 0.9	65520	11	51. 7	8
9	50 18.3	61099	13	51. 2	47 37.9	63424	12	48. 4	9
10	47 15.5	59199	15	48. 2	44 33.7	61308	13	45. 4	10
11	44 28.1	57288	16	45. 5	41 46.5	59199	15	42. 7	11
12	41 54.8	55380	18	43. 1	39 14.8	57110	16	40. 3	12
13	39 34.4	53486	19	40. 8	36 56.9	55056	18	38. 1	13
14	37 25.6	51621	21	38. 8	34 51.4	53044	20	36. 1	14
15	35 27.3	49792	23	36. 9	32 56.7	51088	23	34. 3	15
16	33 38.5	48005	25	35. 2	31 11.9	49183	24	32. 6	16
17	31 58.1	46263	27	33. 6	29 35.7	47335	26	31. 1	17
18	30 25.4	44567	30	32. 2	28 7.3	45548	28	29. 7	18
19	28 59.6	42922	32	30. 8	26 45.7	43814	31	28. 4	19
20	27 39.9	41322	35	29. 6	25 30.3	42142	34	27. 3	20
21	26 25.8	39773	38	28. 5	24 20.4	40525	37	26. 2	21
22	25 16.8	38272	41	27. 4	23 15.5	38961	40	25. 2	22
23	24 12.3	36817	44	26. 5	22 14.9	37451	43	24. 3	23
24	23 11.9	35407	47	25. 5	21 18.4	35994	46	23. 4	24
25	22 15.2	34043	51	24. 7	20 25.5	34584	49	22. 6	25
26	21 22.0	32722	54	23. 9	19 35.8	33223	53	21. 9	26
27	20 31.8	31445	58	23. 2	18 49.2	31909	57	21. 2	27
28	19 44.5	30209	62	22. 5	18 5.2	30639	61	20. 6	28
29	18 59.7	29012	66	21. 8	17 23.7	29410	65	20. 0	29
30	18 17.3	27851	71	21. 2	16 44.4	28222	69	19. 4	30
31	17 37.1	26730	75	20. 7	16 7.2	27074	74	18. 9	31
32	16 58.8	25644	80	20. 1	15 31.8	25964	78	18. 4	32
33	16 22.4	24592	84	19. 6	14 58.2	24890	83	17. 9	33
34	15 47.7	23573	89	19. 2	14 26.2	23850	88	17. 5	34
35	15 14.6	22585	95	18. 7	13 55.7	22845	93	17. 1	35
36	14 42.9	21629	100	18. 3	13 26.5	21872	99	16. 7	36
37	14 12.6	20704	106	17. 9	12 58.6	20931	104	16. 3	37
38	13 43.5	19808	112	17. 5	12 31.9	20019	110	16. 0	38
39	13 15.5	18940	118	17. 2	12 6.2	19136	116	15. 7	39
40	12 48.7	18099	124	16. 8	11 41.5	18283	122	15. 3	40
41	12 22.8	17284	130	16. 5	11 17.8	17456	129	15. 0	41
42	11 57.9	16495	137	16. 2	10 54.9	16655	136	14. 8	42
43	11 33.8	15731	144	15. 9	10 32.9	15882	143	14. 5	43
44	11 10.6	14990	151	15. 6	10 11.6	15131	150	14. 2	44
45	10 48.2	14275	159	15. 4	9 51.1	14406	157	14. 0	45
46	10 26.4	13581	166	15. 1	9 31.2	13705	165	13. 8	46
47	10 5.4	12911	174	14. 9	9 11.9	13025	173	13. 6	47
48	9 44.9	12261	183	14. 7	8 53.2	12368	181	13. 3	48
49	9 25.1	11633	191	14. 4	8 35.0	11734	190	13. 2	49
50	9 5.8	11025	200	14. 2	8 17.4	11118	199	13. 0	50
51	8 47.0	10438	209	14. 0	8 0.3	10524	208	12. 8	51
52	8 28.7	9870	219	13. 9	7 43.6	9951	217	12. 6	52
53	8 10.9	9321	229	13. 7	7 27.3	9396	227	12. 5	53
54	7 53.6	8791	239	13. 5	7 11.4	8861	237	12. 3	54
55	7 36.6	8280	249	13. 3	6 56.0	8345	248	12. 1	55
56	7 20.0	7786	260	13. 2	6 40.8	7847	259	12. 0	56
57	7 3.8	7310	272	13. 0	6 26.0	7367	271	11. 9	57
58	6 48.0	6851	284	12. 9	6 11.6	6904	282	11. 7	58
59	6 32.4	6410	296	12. 8	5 57.4	6458	295	11. 6	59
60	6 17.2	5984	309	12. 7	5 43.5	6029	308	11. 5	60
61	6 2.3	5577	322	12. 5	5 29.9	5618	321	11. 4	61
62	5 47.6	5184	336	12. 4	5 16.5	5222	335	11. 3	62
63	5 33.2	4808	351	12. 3	5 3.4	4843	350	11. 2	63
64	5 19.0	4447	366	12. 2	4 50.5	4479	365	11. 1	64
65	5 5.1	4101	382	12. 1	4 37.8	4131	381	11. 0	65

t° / L°	81° b	A	C	Z′	82° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	80567	5	90. 0	90 0.0	85644	4	90. 0	0
1	83 38.0	80302	5	83. 7	82 51.1	85311	4	82. 9	1
2	77 25.0	79533	6	77. 6	75 54.9	84342	5	76. 1	2
3	71 28.7	78315	6	71. 7	69 21.9	82828	5	69. 6	3
4	65 54.9	76721	6	66. 2	63 19.4	80866	5	63. 6	4
5	60 47.0	74824	7	61. 2	57 50.7	78580	6	58. 2	5
6	56 6.2	72716	8	56. 6	52 56.4	76086	7	53. 4	6
7	51 52.3	70471	9	52. 4	48 34.8	73469	8	49. 1	7
8	48 3.8	68139	10	48. 7	44 43.2	70805	9	45. 3	8
9	44 38.7	65783	11	45. 4	41 18.4	68139	10	41. 9	9
10	41 34.7	63424	12	42. 4	38 17.0	65520	11	39. 0	10
11	38 49.6	61099	13	39. 7	35 36.1	62956	12	36. 4	11
12	36 21.1	58815	15	37. 3	33 12.9	60463	14	34. 1	12
13	34 7.3	56588	17	35. 1	31 5.0	58060	16	32. 0	13
14	32 6.3	54424	18	33. 2	29 10.2	55741	17	30. 2	14
15	30 16.6	52330	20	31. 5	27 26.8	53515	19	28. 5	15
16	28 36.9	50308	23	29. 9	25 53.4	51373	21	27. 0	16
17	27 5.9	48355	25	28. 4	24 28.5	49316	24	25. 7	17
18	25 42.5	46473	27	27. 1	23 11.2	47345	26	24. 5	18
19	24 26.0	44663	30	25. 9	22 0.5	45450	29	23. 3	19
20	23 15.5	42912	32	24. 8	20 55.5	43631	31	22. 3	20
21	22 10.3	41231	35	23. 8	19 55.7	41884	34	21. 4	21
22	21 10.0	39609	38	22. 9	19 0.4	40207	37	20. 6	22
23	20 13.8	38048	41	22. 1	18 9.2	38595	40	19. 8	23
24	19 21.6	36541	45	21. 3	17 21.5	37044	44	19. 1	24
25	18 32.7	35091	48	20. 5	16 37.1	35552	47	18. 4	25
26	17 47.0	33691	52	19. 9	15 55.6	34117	51	17. 8	26
27	17 4.1	32339	56	19. 2	15 16.6	32732	54	17. 2	27
28	16 23.7	31037	59	18. 6	14 40.1	31399	58	16. 7	28
29	15 45.6	29778	64	18. 1	14 5.7	30116	62	16. 2	29
30	15 9.6	28565	68	17. 6	13 33.2	28877	67	15. 7	30
31	14 35.6	27392	72	17. 1	13 2.5	27680	71	15. 3	31
32	14 3.3	26259	77	16. 6	12 33.4	26528	76	14. 9	32
33	13 32.6	25163	82	16. 2	12 5.8	25415	81	14. 5	33
34	13 3.4	24107	87	15. 8	11 39.5	24339	86	14. 1	34
35	12 35.6	23083	92	15. 4	11 14.5	23300	91	13. 8	35
36	12 9.1	22094	97	15. 1	10 50.6	22296	96	13. 4	36
37	11 43.7	21138	103	14. 7	10 27.8	21326	102	13. 1	37
38	11 19.3	20213	109	14. 4	10 6.0	20387	108	12. 9	38
39	10 56.0	19317	115	14. 1	9 45.1	19481	114	12. 6	39
40	10 33.6	18451	121	13. 8	9 25.0	18604	120	12. 3	40
41	10 12.1	17614	128	13. 6	9 5.8	17756	126	12. 1	41
42	9 51.4	16802	134	13. 3	8 47.2	16936	133	11. 9	42
43	9 31.4	16019	141	13. 1	8 29.3	16143	140	11. 6	43
44	9 12.1	15261	148	12. 8	8 12.1	15376	147	11. 4	44
45	8 53.5	14526	156	12. 6	7 55.4	14635	155	11. 2	45
46	8 35.4	13817	164	12. 4	7 39.3	13918	162	11. 1	46
47	8 18.0	13129	172	12. 2	7 23.7	13224	170	10. 9	47
48	8 1.1	12466	180	12. 0	7 8.6	12554	179	10. 7	48
49	7 44.6	11824	188	11. 9	6 53.9	11906	187	10. 5	49
50	7 28.7	11203	197	11. 7	6 39.7	11280	196	10. 4	50
51	7 13.2	10604	207	11. 5	6 25.8	10676	205	10. 3	51
52	6 58.1	10025	216	11. 4	6 12.3	10091	215	10. 1	52
53	6 43.4	9465	226	11. 2	5 59.2	9528	225	10. 0	53
54	6 29.1	8926	236	11. 1	5 46.4	8984	235	9. 9	54
55	6 15.1	8405	247	10. 9	5 34.0	8458	246	9. 7	55
56	6 1.4	7902	258	10. 8	5 21.8	7952	257	9. 6	56
57	5 48.1	7418	269	10. 7	5 9.9	7464	268	9. 5	57
58	5 35.0	6952	281	10. 6	4 58.2	6994	280	9. 4	58
59	5 22.2	6502	294	10. 5	4 46.8	6542	292	9. 3	59
60	5 9.6	6070	306	10. 4	4 35.6	6107	305	9. 2	60
61	4 57.4	5655	320	10. 3	4 24.7	5689	319	9. 1	61
62	4 45.3	5256	334	10. 2	4 13.9	5287	333	9. 0	62
63	4 33.4	4874	348	10. 1	4 3.4	4903	347	9. 0	63
64	4 21.8	4508	364	10. 0	3 53.0	4534	362	8. 9	64
65	4 10.3	4158	379	9. 9	3 42.8	4181	378	8. 8	65

t° / L°	83° b	A	C	Z′	84° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	91411	3	90. 0	90 0.0	98077	2	90. 0	0
1	81 50.9	90976	3	81. 9	80 31.2	97480	2	80. 6	1
2	74 0.6	89725	4	74. 1	71 31.6	95805	3	71. 6	2
3	66 43.8	87783	4	66. 9	63 22.3	93274	3	63. 5	3
4	60 9.2	85337	4	60. 4	56 13.1	90151	3	56. 4	4
5	54 19.6	82551	5	54. 6	50 4.3	86712	4	50. 3	5
6	49 13.5	79572	6	49. 6	44 50.6	83139	5	45. 2	6
7	44 47.1	76525	7	45. 2	40 24.5	79572	6	40. 8	7
8	40 55.8	73469	8	41. 4	36 38.4	76086	7	37. 1	8
9	37 34.6	70471	9	38. 1	33 25.4	72716	8	33. 9	9
10	34 39.0	67551	10	35. 3	30 39.6	69491	9	31. 2	10
11	32 5.2	64742	11	32. 8	28 16.2	66426	10	28. 8	11
12	29 49.7	62040	13	30. 6	26 11.2	63509	12	26. 8	12
13	27 49.7	59453	15	28. 6	24 21.6	60740	14	25. 0	13
14	26 2.9	56979	16	26. 9	22 44.7	58115	16	23. 5	14
15	24 27.4	54619	18	25. 4	21 18.7	55624	17	22. 1	15
16	23 1.6	52358	20	24. 0	20 1.7	53258	20	20. 9	16
17	21 44.0	50205	23	22. 8	18 52.5	51006	22	19. 8	17
18	20 33.6	48142	25	21. 7	17 50.0	48865	24	18. 8	18
19	19 29.4	46173	28	20. 7	16 53.2	46822	27	17. 9	19
20	18 30.7	44288	30	19. 7	16 1.4	44874	29	17. 1	20
21	17 36.8	42479	33	18. 9	15 14.0	43014	32	16. 3	21
22	16 47.1	40753	36	18. 1	14 30.3	41234	35	15. 7	32
23	16 1.1	39092	39	17. 4	13 50.0	39535	38	15. 1	23
24	15 18.5	37501	43	16. 8	13 12.7	37905	42	14. 5	24
25	14 38.8	35972	46	16. 2	12 38.1	36341	45	14. 0	25
26	14 1.8	34502	50	15. 6	12 5.8	34840	49	13. 5	26
27	13 27.1	33088	53	15. 1	11 35.6	33400	53	13. 0	27
28	12 54.6	31726	57	14. 7	11 7.3	32015	56	12. 6	28
29	12 24.0	30418	61	14. 2	10 40.7	30684	61	12. 2	29
30	11 55.2	29156	66	13. 8	10 15.7	29401	65	11. 9	30
31	11 27.9	27941	70	13. 4	9 52.1	28169	69	11. 5	31
32	11 2.2	26769	75	13. 0	9 29.8	26980	74	11. 2	32
33	10 37.7	25638	80	12. 7	9 8.6	25834	79	10. 9	33
34	10 14.5	24547	85	12. 4	8 48.5	24728	84	10. 6	34
35	9 52.4	23493	90	12. 1	8 29.4	23663	89	10. 4	35
36	9 31.3	22476	95	11. 8	8 11.2	22633	94	10. 1	36
37	9 11.2	21493	101	11. 5	7 53.8	21640	100	9. 9	37
38	8 52.0	20543	107	11. 3	7 37.2	20681	106	9. 7	38
39	8 33.5	19626	113	11. 0	7 21.3	19753	112	9. 5	39
40	8 15.8	18740	119	10. 8	7 6.1	18858	118	9. 3	40
41	7 58.8	17884	125	10. 6	6 51.4	17994	125	9. 1	41
42	7 42.5	17055	135	10. 4	6 37.3	17159	131	8. 9	42
43	7 26.7	16253	139	10. 2	6 23.7	16350	138	8. 8	43
44	7 11.6	15480	146	10. 0	6 10.7	15571	148	8. 6	44
45	6 56.9	14732	154	9. 9	5 58.0	14815	153	8. 5	45
46	6 42.7	14008	162	9. 7	5 45.8	14087	161	8. 3	46
47	6 29.0	13308	169	9. 5	5 34.0	13382	169	8. 2	47
48	6 15.7	12633	178	9. 4	5 22.6	12701	177	8. 1	48
49	6 2.8	11980	186	9. 2	5 11.5	12044	185	7. 9	49
50	5 50.3	11349	195	9. 1	5 0.8	11408	194	7. 8	50
51	5 38.2	10739	204	9. 0	4 50.3	10795	204	7. 7	51
52	5 26.3	10151	214	8. 9	4 40.1	10202	213	7. 6	52
53	5 14.8	9583	224	8. 7	4 30.2	9630	223	7. 5	53
54	5 3.6	9035	234	8. 6	4 20.6	9079	233	7. 4	54
55	4 52.6	8506	245	8. 5	4 11.2	8547	244	7. 3	55
56	4 42.0	7996	256	8. 4	4 2.0	8035	255	7. 2	56
57	4 31.5	7505	267	8. 3	3 53.0	7541	266	7. 1	57
58	4 21.3	7032	279	8. 2	3 44.2	7066	278	7. 1	58
59	4 11.3	6577	291	8. 2	3 35.6	6608	291	7. 0	59
60	4 1.5	6139	304	8. 1	3 27.2	6168	303	6. 9	60
61	3 51.9	5719	318	8. 0	3 19.0	5745	317	6. 9	61
62	3 42.5	5316	332	7. 9	3 10.9	5340	331	6. 8	62
63	3 33.2	4929	346	7. 8	3 2.9	4951	345	6. 7	63
64	3 24.1	4557	361	7. 8	2 55.1	4578	361	6. 7	64
65	3 15.2	4203	377	7. 7	2 47.4	4221	377	6. 6	65

t° / L°	85° b	85° A	85° C	85° Z′	86° b	86° A	86° C	86° Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	105970	2	90. 0	90 0.0	115642	1	90. 0	0
1	78 40.5	105126	2	78. 7	75 57.1	114325	1	76. 0	1
2	68 9.9	102771	2	68. 3	63 24.4	110809	1	63. 5	2
3	58 58.9	99335	2	59. 1	53 5.0	105985	2	53. 2	3
4	51 15.6	95285	3	51. 4	44 55.8	100642	2	45. 1	4
5	44 53.4	91001	3	45. 1	38 34.0	95285	3	38. 7	5
6	39 40.0	86712	4	39. 9	33 34.3	90151	3	33. 8	6
7	35 22.1	82551	5	35. 7	29 36.1	85337	4	29. 8	7
8	31 48.3	78580	6	32. 2	26 23.8	80866	5	26. 7	8
9	28 49.4	74824	7	29. 2	23 46.2	76721	8	24. 1	9
10	26 18.1	71287	8	26. 7	21 35.1	72874	8	21. 9	10
11	24 9.0	67962	10	24. 6	19 44.5	69308	9	20. 1	11
12	22 17.7	64837	11	22. 8	18 10.1	65991	11	18. 6	12
13	20 40.9	61898	13	21. 3	16 48.7	62893	12	17. 3	13
14	19 16.1	59127	15	19. 9	15 37.8	59994	14	16. 1	14
15	18 1.1	56516	17	18. 7	14 35.5	57274	16	15. 1	15
16	16 54.4	54048	19	17. 6	13 40.4	54717	18	14. 2	16
17	15 54.7	51708	21	16. 7	12 51.2	52306	20	13. 5	17
18	15 0.9	49494	23	15. 8	12 7.0	50023	23	12. 8	18
19	14 12.3	47387	26	15. 0	11 27.1	47861	25	12. 1	19
20	13 28.0	45385	29	14. 3	10 51.0	45812	28	11. 6	20
21	12 47.5	43477	32	13. 7	10 18.0	43863	31	11. 0	21
22	12 10.4	41655	34	13. 1	9 47.7	42004	34	10. 6	22
23	11 36.2	39913	38	12. 6	9 19.9	40234	37	10. 1	23
24	11 4.6	38252	41	12. 1	8 54.3	38542	40	9. 8	24
25	10 35.2	36660	44	11. 7	8 30.5	36924	44	9. 4	25
26	10 7.9	35133	48	11. 3	8 8.4	35376	47	9. 1	26
27	9 42.4	33669	52	10. 9	7 47.7	33893	51	8. 8	27
28	9 18.5	32264	56	10. 6	7 28.4	32468	55	8. 5	28
29	8 56.1	30911	60	10. 2	7 10.4	31103	59	8. 2	29
30	8 35.1	29615	64	9. 9	6 53.4	29789	64	8. 0	30
31	8 15.2	28363	69	9. 6	6 37.3	28525	68	7. 7	31
32	7 56.4	27161	73	9. 4	6 22.2	27309	73	7. 5	32
33	7 38.6	26000	78	9. 1	6 7.9	26139	78	7. 3	33
34	7 21.8	24885	83	8. 9	5 54.3	25012	83	7. 1	34
35	7 5.7	23807	88	8. 7	5 41.4	23927	88	7. 0	35
36	6 50.4	22769	94	8. 5	5 29.1	22879	93	6. 8	36
37	6 35.8	21766	99	8. 3	5 17.3	21868	100	6. 6	37
38	6 21.9	20797	105	8. 1	5 6.1	20894	105	6. 5	38
39	6 8.6	19863	111	7. 9	4 55.4	19953	111	6. 3	39
40	5 55.8	18960	117	7. 8	4 45.1	19043	117	6. 2	40
41	5 43.5	18089	124	7. 6	4 35.3	18167	123	6. 1	41
42	5 31.7	17246	131	7. 4	4 25.8	17319	130	6. 0	42
43	5 20.4	16433	138	7. 3	4 16.7	16500	137	5. 9	43
44	5 9.4	15646	145	7. 2	4 7.9	15709	144	5. 7	44
45	4 58.9	14886	152	7. 1	3 59.4	14945	152	5. 6	45
46	4 48.7	14154	160	6. 9	3 51.2	14208	159	5. 6	46
47	4 38.8	13443	168	6. 8	3 43.3	13495	167	5. 5	47
48	4 29.2	12759	176	6. 7	3 35.6	12808	176	5. 4	48
49	4 20.0	12097	185	6. 6	3 28.2	12142	184	5. 3	49
50	4 11.0	11458	194	6. 5	3 21.0	11501	193	5. 2	50
51	4 2.2	10842	203	6. 4	3 14.0	10880	202	5. 1	51
52	3 53.7	10247	212	6. 3	3 7.2	10283	212	5. 1	52
53	3 45.5	9672	222	6. 3	3 0.5	9706	222	5. 0	53
54	3 37.4	9118	232	6. 2	2 54.1	9148	232	4. 9	54
55	3 29.5	8582	243	6. 1	2 47.8	8612	242	4. 9	55
56	3 21.9	8068	254	6. 0	2 41.6	8095	253	4. 8	56
57	3 14.4	7571	266	6. 0	2 35.6	7597	265	4. 8	57
58	3 7.0	7093	277	5. 9	2 29.8	7117	277	4. 7	58
59	2 59.9	6634	290	5. 8	2 24.0	6656	289	4. 7	59
60	2 52.8	6193	303	5. 8	2 18.4	6212	302	4. 6	60
61	2 46.0	5767	316	5. 7	2 12.9	5786	315	4. 6	61
62	2 39.2	5360	330	5. 7	2 7.4	5376	329	4. 5	62
63	2 32.6	4969	345	5. 6	2 2.1	4984	344	4. 5	63
64	2 26.0	4595	360	5. 6	1 56.9	4608	359	4. 4	64
65	2 19.6	4236	376	5. 5	1 51.8	4250	375	4. 4	65

t° / L°	87° b	A	C	Z′	88° b	A	C	Z′	t° / L°
	° ′			°	° ′			°	
0	90 0.0	128120	1	90.0	90 0.0	145718	0	90.0	0
1	71 33.3	125843	1	71.6	63 25.7	140863	0	63.4	1
2	56 17.2	120151	1	56.3	44 59.0	130677	1	45.0	2
3	44 57.6	113099	1	45.0	33 39.6	120151	1	33.7	3
4	36 48.8	105985	1	36.9	26 31.4	110809	1	26.6	4
5	30 53.3	99335	2	31.0	21 44.8	102771	2	21.8	5
6	26 28.2	93274	3	26.6	18 22.1	95805	3	18.5	6
7	23 5.1	87783	4	23.3	15 52.0	89725	4	16.0	7
8	20 25.5	82828	5	20.6	13 56.7	84342	5	14.1	8
9	18 17.1	78315	6	18.5	12 25.6	79533	6	12.6	9
10	16 31.9	74197	7	16.8	11 11.7	75196	7	11.4	10
11	15 4.2	70421	9	15.4	10 10.7	71250	8	10.4	11
12	13 49.9	66936	10	14.1	9 19.4	67633	10	9.5	12
13	12 46.4	63700	12	13.1	8 35.8	64302	12	8.8	13
14	11 51.3	60696	14	12.2	7 58.1	61208	13	8.2	14
15	11 3.1	57887	16	11.4	7 25.2	58334	15	7.7	15
16	10 20.6	55254	18	10.8	6 56.4	55645	17	7.2	16
17	9 42.8	52779	20	10.2	6 30.7	53126	20	6.8	17
18	9 9.0	50446	22	9.6	6 7.8	50750	22	6.4	18
19	8 38.6	48236	25	9.1	5 47.2	48512	25	6.1	19
20	8 11.0	46149	27	8.7	5 28.6	46397	27	5.8	20
21	7 45.8	44168	30	8.3	5 11.7	44389	30	5.6	21
22	7 22.8	42281	33	8.0	4 56.2	42479	33	5.3	22
23	7 1.7	40483	37	7.6	4 42.0	40667	36	5.1	23
24	6 42.3	38769	40	7.3	4 28.9	38935	40	4.9	24
25	6 24.2	37132	43	7.1	4 16.8	37283	43	4.7	25
26	6 7.5	35568	47	6.8	4 5.6	35705	47	4.6	26
27	5 51.9	34067	51	6.6	3 55.1	34194	50	4.4	27
28	5 37.3	32631	55	6.4	3 45.3	32746	54	4.3	28
29	5 23.6	31249	59	6.2	3 36.2	31356	58	4.1	29
30	5 10.8	29926	63	6.0	3 27.6	30025	63	4.0	30
31	4 58.7	28652	68	5.8	3 19.4	28742	67	3.9	31
32	4 47.3	27428	72	5.6	3 11.8	27510	72	3.8	32
33	4 36.5	26249	77	5.5	3 4.6	26326	77	3.7	33
34	4 26.2	25113	82	5.4	2 57.7	25186	82	3.6	34
35	4 16.5	24020	87	5.2	2 51.2	24087	87	3.5	35
36	4 7.2	22966	93	5.1	2 45.0	23028	92	3.4	36
37	3 58.4	21950	98	5.0	2 39.1	22006	98	3.3	37
38	3 49.9	20969	104	4.9	2 33.5	21022	104	3.2	38
39	3 41.9	20022	110	4.8	2 28.1	20072	110	3.2	39
40	3 34.1	19109	116	4.7	2 22.9	19155	116	3.1	40
41	3 26.7	18228	123	4.6	2 17.9	18271	122	3.0	41
42	3 19.6	17376	130	4.5	2 13.2	17417	129	3.0	42
43	3 12.7	16553	136	4.4	2 8.6	16592	136	3.0	43
44	3 6.1	15759	144	4.3	2 4.2	15794	143	2.9	44
45	2 59.8	14992	151	4.2	1 59.9	15025	151	2.8	45
46	2 53.6	14251	159	4.2	1 55.8	14282	158	2.8	46
47	2 47.6	13535	167	4.1	1 51.8	13565	166	2.7	47
48	2 41.9	12845	175	4.0	1 48.0	12871	175	2.7	48
49	2 36.3	12177	184	4.0	1 44.3	12202	183	2.7	49
50	2 30.9	11532	193	3.9	1 40.6	11555	192	2.6	50
51	2 25.6	10911	202	3.9	1 37.1	10932	201	2.6	51
52	2 20.5	10310	211	3.8	1 33.7	10331	211	2.5	52
53	2 15.5	9732	221	3.8	1 30.4	9750	221	2.5	53
54	2 10.7	9173	231	3.7	1 27.1	9191	231	2.5	54
55	2 5.9	8634	242	3.7	1 24.0	8650	242	2.4	55
56	2 1.3	8116	253	3.6	1 20.9	8131	253	2.4	56
57	1 56.8	7615	264	3.6	1 17.9	7630	264	2.4	57
58	1 52.4	7135	276	3.5	1 15.0	7147	276	2.4	58
59	1 48.1	6672	289	3.5	1 12.1	6683	288	2.3	59
60	1 43.8	6227	302	3.5	1 9.3	6238	301	2.3	60
61	1 39.7	5800	315	3.4	1 6.5	5809	315	2.3	61
62	1 35.6	5389	329	3.4	1 3.8	5399	329	2.3	62
63	1 31.7	4997	344	3.4	1 1.1	5005	343	2.2	63
64	1 27.7	4620	359	3.3	0 58.5	4628	358	2.2	64
65	1 23.9	4260	375	3.3	0 55.9	4267	374	2.2	65

t° / L°	89° b	89° A	89° C	89° Z′	90° b	90° A	90° C	90° Z′	t° / L°
	° ′			°	° ′				
0	90 0.0	175814	0	90. 0	0	∞	0	∞	0
1	44 59.7	160741	0	45. 0	0	175814	0	0	1
2	26 33.3	140863	0	26. 6	0	145718	0	0	2
3	18 25.1	125843	1	18. 4	0	128120	0	0	3
4	14 0.8	114325	1	14. 0	0	115642	1	0	4
5	11 16.9	105126	2	11. 3	0	105970	2	0	5
6	9 25.7	97480	2	9. 5	0	98077	2	0	6
7	8 5.4	90976	3	8. 2	0	91411	3	0	7
8	7 4.7	85311	4	7. 1	0	85644	4	0	8
9	6 17.3	80302	5	6. 4	0	80567	5	0	9
10	5 39.2	75819	7	5. 7	0	76033	7	0	10
11	5 7.8	71765	8	5. 2	0	71940	8	0	11
12	4 41.6	68063	10	4. 8	0	68212	10	0	12
13	4 19.4	64664	11	4. 4	0	64791	11	0	13
14	4 0.2	61525	13	4. 1	0	61632	13	0	14
15	3 43.6	58606	15	3. 9	0	58700	15	0	15
16	3 29.0	55887	17	3. 6	0	55966	17	0	16
17	3 16.0	53336	19	3. 4	0	53406	19	0	17
18	3 4.5	50939	22	3. 2	0	51002	22	0	18
19	2 54.1	48680	24	3. 1	0	48736	24	0	19
20	2 44.7	46545	27	2. 9	0	46595	27	0	20
21	2 36.2	44520	30	2. 8	0	44567	30	0	21
22	2 28.4	42601	33	2. 7	0	42642	33	0	22
23	2 21.3	40776	36	2. 6	0	40812	36	0	23
24	2 14.7	39034	39	2. 5	0	39069	39	0	24
25	2 8.6	37375	43	2. 4	0	37405	43	0	25
26	2 3.0	35787	46	2. 3	0	35816	46	0	26
27	1 57.7	34271	50	2. 2	0	34295	50	0	27
28	1 52.8	32815	54	2. 1	0	32839	54	0	28
29	1 48.2	31422	58	2. 1	0	31443	58	0	29
30	1 43.9	30083	63	2. 0	0	30103	62	0	30
31	1 39.8	28797	67	1. 9	0	28816	67	0	31
32	1 36.0	27563	72	1. 9	0	27579	72	0	32
33	1 32.4	26374	76	1. 8	0	26389	76	0	33
34	1 28.9	25229	81	1. 8	0	25244	81	0	34
35	1 25.7	24128	87	1. 7	0	24141	87	0	35
36	1 22.6	23066	92	1. 7	0	23078	92	0	36
37	1 19.6	22042	98	1. 7	0	22054	98	0	37
38	1 16.8	21055	104	1. 6	0	21066	103	0	38
39	1 14.1	20103	110	1. 6	0	20113	110	0	39
40	1 11.5	19184	116	1. 6	0	19193	116	0	40
41	1 9.0	18297	122	1. 5	0	18306	122	0	41
42	1 6.6	17441	129	1. 5	0	17449	129	0	42
43	1 4.3	16613	136	1. 5	0	16622	136	0	43
44	1 2.1	15816	143	1. 4	0	15823	143	0	44
45	1 0.0	15045	151	1. 4	0	15051	151	0	45
46	0 57.9	14300	158	1. 4	0	14307	158	0	46
47	0 55.9	13581	166	1. 4	0	13587	166	0	47
48	0 54.0	12887	175	1. 3	0	12893	174	0	48
49	0 52.2	12216	183	1. 3	0	12222	183	0	49
50	0 50.3	11570	192	1. 3	0	11575	192	0	50
51	0 48.6	10946	201	1. 3	0	10950	201	0	51
52	0 46.9	10343	211	1. 3	0	10347	211	0	52
53	0 45.2	9762	221	1. 3	0	9765	221	0	53
54	0 43.6	9200	231	1. 2	0	9204	231	0	54
55	0 42.0	8660	241	1. 2	0	8664	241	0	55
56	0 40.5	8139	253	1. 2	0	8143	252	0	56
57	0 39.0	7639	264	1. 2	0	7641	264	0	57
58	0 37.5	7155	276	1. 2	0	7158	276	0	58
59	0 36.0	6691	288	1. 2	0	6693	288	0	59
60	0 34.6	6245	301	1. 2	0	6247	301	0	60
61	0 33.3	5816	315	1. 1	0	5818	314	0	61
62	0 31.9	5405	328	1. 1	0	5407	328	0	62
63	0 30.6	5009	343	1. 1	0	5012	343	0	63
64	0 29.3	4632	358	1. 1	0	4634	358	0	64
65	0 28.0	4272	374	1. 1	0	4272	374	0	65

	0°		1°		2°		3°		4°		Corr.	
	h_o 0°	Z″ 89°	h_o 1°	Z″ 88°	h_o 2°	Z″ 87°	h_o 3°	Z″ 86°	h_o 4°	Z″ 85°	Z″	
′	B	D	B	D	B	D	B	D	B	D	°	′
0	-------	-----	175814	1758	145718	1457	128120	1281	115642	1155	1.0	60
1	353627	3536	175097	1751	145358	1453	127880	1278	115461	1154	1.0	59
2	323524	3235	174391	1744	145001	1450	127641	1276	115282	1152	1.0	58
3	305915	3059	173696	1737	144646	1446	127403	1273	115103	1150	1.0	57
4	293421	2934	173012	1730	144295	1443	127166	1271	114925	1148	.9	56
5	283730	2837	172339	1723	143946	1439	126931	1269	114748	1146	.9	55
6	275812	2758	171676	1717	143600	1436	126697	1266	114571	1145	.9	54
7	269118	2691	171023	1710	143257	1432	126465	1264	114395	1143	.9	53
8	263318	2633	170379	1704	142916	1429	126233	1262	114220	1141	.9	52
9	258203	2582	169745	1697	142579	1425	126003	1259	114045	1139	.9	51
10	253627	2536	169121	1691	142243	1422	125774	1257	113872	1138	.8	50
11	249488	2495	168505	1685	141911	1419	125546	1255	113699	1136	.8	49
12	245709	2457	167897	1679	141581	1415	125320	1253	113526	1134	.8	48
13	242233	2422	167298	1673	141253	1412	125094	1250	113355	1132	.8	47
14	239015	2390	166708	1667	140928	1409	124870	1248	113184	1131	.8	46
15	236018	2360	166125	1661	140605	1406	124647	1246	113013	1129	.8	45
16	233216	2332	165550	1655	140285	1403	124425	1244	112844	1127	.7	44
17	230583	2306	164982	1650	139967	1399	124205	1241	112675	1126	.7	43
18	228100	2281	164422	1644	139651	1396	123985	1239	112506	1124	.7	42
19	225752	2258	163869	1639	139338	1393	123766	1237	112339	1122	.7	41
20	223525	2235	163322	1633	139027	1390	123549	1235	112171	1120	.7	40
21	221406	2214	162783	1628	138718	1387	123333	1233	112005	1119	.7	39
22	219385	2194	162250	1622	138411	1384	123117	1230	111839	1117	.6	38
23	217455	2175	161724	1617	138106	1381	122903	1228	111674	1115	.6	37
24	215607	2156	161204	1612	137804	1378	122690	1226	111510	1114	.6	36
25	213834	2138	160690	1607	137503	1375	122478	1224	111346	1112	.6	35
26	212130	2121	160182	1602	137205	1372	122267	1222	111183	1111	.6	34
27	210491	2105	159680	1597	136909	1369	122057	1220	111020	1109	.6	33
28	208912	2089	159184	1592	136615	1366	121848	1218	110858	1107	.5	32
29	207388	2074	158693	1587	136322	1363	121640	1216	110696	1106	.5	31
30	205916	2059	158208	1582	136032	1360	121432	1214	110536	1104	.5	30
31	204492	2045	157728	1577	135744	1357	121226	1211	110375	1102	.5	29
32	203113	2031	157254	1572	135457	1354	121021	1209	110216	1101	.5	28
33	201777	2018	156784	1568	135173	1351	120817	1207	110057	1099	.5	27
34	200480	2005	156320	1563	134890	1348	120614	1205	109898	1098	.4	26
35	199221	1992	155861	1558	134609	1346	120412	1203	109740	1096	.4	25
36	197998	1980	155406	1554	134330	1343	120211	1201	109583	1094	.4	24
37	196808	1968	154956	1549	134053	1340	120010	1199	109426	1093	.4	23
38	195650	1956	154511	1545	133777	1337	119811	1197	109270	1091	.4	22
39	194522	1945	154070	1541	133503	1335	119612	1195	109115	1090	.4	21
40	193422	1934	153634	1536	133231	1332	119415	1193	108960	1088	.3	20
41	192350	1923	153201	1532	132961	1329	119218	1191	108805	1087	.3	19
42	191304	1913	152774	1528	132692	1326	119022	1189	108651	1085	.3	18
43	190282	1903	152350	1523	132425	1324	118827	1187	108498	1084	.3	17
44	189283	1893	151931	1519	132159	1321	118633	1185	108345	1082	.3	16
45	188307	1883	151515	1515	131896	1318	118440	1183	108193	1080	.3	15
46	187353	1873	151104	1511	131633	1316	118248	1182	108041	1079	.2	14
47	186419	1864	150696	1507	131373	1313	118056	1180	107890	1077	.2	13
48	185505	1855	150292	1503	131114	1311	117866	1178	107739	1076	.2	12
49	184609	1846	149892	1499	130856	1308	117676	1176	107589	1074	.2	11
50	183732	1837	149496	1495	130600	1305	117487	1174	107439	1073	.2	10
51	182872	1829	149103	1491	130346	1303	117299	1172	107290	1071	.2	9
52	182029	1820	148713	1487	130093	1300	117112	1170	107141	1070	.1	8
53	181202	1812	148327	1483	129841	1298	116925	1168	106993	1068	.1	7
54	180390	1804	147945	1479	129591	1295	116739	1166	106846	1067	.1	6
55	179593	1796	147566	1475	129342	1293	116554	1165	106699	1065	.1	5
56	178811	1788	147190	1472	129095	1290	116370	1163	106552	1064	.1	4
57	178042	1780	146817	1468	128849	1288	116187	1161	106406	1062	.1	3
58	177287	1773	146448	1464	128605	1285	116004	1159	106260	1061	.0	2
59	176544	1765	146081	1461	128362	1283	115823	1157	106115	1060	.0	1
60	175814	1758	145718	1457	128120	1281	115642	1155	105970	1058	.0	0
	179°		178°		177°		176°		175°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	5°		6°		7°		8°		9°		Corr.	
	h_c 5°	Z″ 84°	h_c 6°	Z″ 83°	h_c 7°	Z″ 82°	h_c 8°	Z″ 81°	h_c 9°	Z″ 80°	Z″	
′	B	D	B	D	B	D	B	D	B	D	°	′
0	105970	1058	98077	978	91411	911	85644	852	80567	800	1.0	60
1	105826	1057	97957	977	91308	910	85555	851	80487	799	1.0	59
2	105683	1055	97837	976	91205	909	85465	850	80408	799	1.0	58
3	105539	1054	97717	975	91103	908	85376	849	80328	798	1.0	57
4	105397	1052	97598	974	91001	907	85286	849	80249	797	.9	56
5	105254	1051	97480	972	90899	906	85197	848	80170	796	.9	55
6	105113	1049	97361	971	90798	905	85109	847	80091	795	.9	54
7	104971	1048	97243	970	90696	904	85020	846	80012	795	.9	53
8	104830	1047	97126	969	90595	903	84931	845	79933	794	.9	52
9	104690	1045	97008	968	90494	902	84843	844	79855	793	.9	51
10	104550	1044	96891	966	90394	901	84755	843	79777	792	.8	50
11	104411	1042	96774	965	90293	900	84667	842	79698	791	.8	49
12	104272	1041	96658	964	90193	899	84579	841	79620	791	.8	48
13	104133	1040	96542	963	90093	897	84492	840	79542	790	.8	47
14	103995	1038	96426	962	89994	896	84404	840	79465	789	.8	46
15	103857	1037	96310	961	89894	895	84317	839	79387	788	.8	45
16	103720	1035	96195	959	89795	894	84230	838	79309	787	.7	44
17	103583	1034	96080	958	89696	893	84143	837	79232	787	.7	43
18	103447	1033	95966	957	89598	892	84056	836	79155	786	.7	42
19	103311	1031	95851	956	89499	891	83970	835	79078	785	.7	41
20	103175	1030	95738	955	89401	890	83884	834	79001	784	.7	40
21	103040	1029	95624	954	89303	889	83797	833	78924	783	.7	39
22	102905	1027	95510	952	89205	888	83711	832	78847	783	.6	38
23	102771	1026	95397	951	89107	887	83626	832	78771	782	.6	37
24	102637	1024	95285	950	89010	886	83540	831	78694	781	.6	36
25	102504	1023	95172	949	88913	885	83455	830	78618	780	.6	35
26	102371	1022	95060	948	88816	884	83369	829	78542	780	.6	34
27	102238	1020	94948	947	88719	884	83284	828	78466	779	.6	33
28	102106	1019	94836	946	88623	883	83199	827	78390	778	.5	32
29	101974	1018	94725	944	88526	882	83114	826	78315	777	.5	31
30	101843	1016	94614	943	88430	881	83030	826	78239	776	.5	30
31	101712	1015	94503	942	88334	880	82945	825	78164	776	.5	29
32	101581	1014	94393	941	88239	879	82861	824	78088	775	.5	28
33	101451	1012	94283	940	88143	878	82777	823	78013	774	.5	27
34	101321	1011	94173	939	88048	877	82693	822	77938	773	.4	26
35	101192	1010	94063	938	87953	876	82609	821	77863	772	.4	25
36	101063	1009	93954	937	87858	875	82526	820	77789	772	.4	24
37	100934	1007	93845	936	87764	874	82442	819	77714	771	.4	23
38	100806	1006	93736	934	87669	873	82359	819	77639	770	.4	22
39	100678	1005	93628	933	87575	872	82276	818	77565	769	.4	21
40	100550	1003	93519	932	87481	871	82193	817	77491	769	.3	20
41	100423	1002	93411	931	87388	870	82110	816	77417	768	.3	19
42	100296	1001	93304	930	87294	869	82027	815	77343	767	.3	18
43	100170	1000	93196	929	87201	868	81945	814	77269	766	.3	17
44	100044	998	93089	928	87108	867	81863	814	77195	766	.3	16
45	99918	997	92982	927	87015	866	81780	813	77122	765	.3	15
46	99793	996	92876	926	86922	865	81698	812	77048	764	.2	14
47	99668	994	92769	925	86829	864	81617	811	76975	763	.2	13
48	99544	993	92663	924	86737	863	81535	810	76902	763	.2	12
49	99419	992	92558	922	86645	862	81453	809	76829	762	.2	11
50	99296	991	92452	921	86553	861	81372	809	76756	761	.2	10
51	99172	989	92347	920	86461	861	81291	808	76683	760	.2	9
52	99049	988	92242	919	86370	860	81210	807	76610	760	.1	8
53	98926	987	92137	918	86278	859	81129	806	76538	759	.1	7
54	98804	986	92032	917	86187	858	81048	805	76465	758	.1	6
55	98682	985	91928	916	86096	857	80967	804	76393	757	.1	5
56	98560	983	91824	915	86006	856	80887	804	76321	757	.1	4
57	98439	982	91720	914	85915	855	80807	803	76248	756	.1	3
58	98318	981	91617	913	85825	854	80727	802	76177	755	.0	2
59	98197	980	91514	912	85734	853	80647	801	76105	754	.0	1
60	98077	978	91411	911	85644	852	80567	800	76033	754	.0	0
	174°		173°		172°		171°		170°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	10°		11°		12°		13°		14°		Corr. Z″	
	h_c 10°	Z″ 79°	h_c 11°	Z″ 78°	h_c 12°	Z″ 77°	h_c 13°	Z″ 76°	h_c 14°	Z″ 75°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	76033	754	71940	711	68212	673	64791	637	61632	603	1.0	60
1	75961	753	71875	711	68153	672	64737	636	61582	603	1.0	59
2	75890	752	71810	710	68093	671	64682	635	61531	602	1.0	58
3	75819	751	71746	709	68034	671	64627	635	61481	602	1.0	57
4	75747	751	71681	709	67975	670	64573	634	61430	601	.9	56
5	75676	750	71616	708	67916	669	64519	634	61380	601	.9	55
6	75605	749	71552	707	67857	669	64464	633	61330	600	.9	54
7	75534	749	71488	707	67798	668	64410	633	61279	599	.9	53
8	75464	748	71423	706	67739	668	64356	632	61229	599	.9	52
9	75393	747	71359	705	67681	667	64302	631	61179	598	.9	51
10	75323	746	71295	705	67622	666	64248	631	61129	598	.8	50
11	75252	746	71231	704	67563	666	64194	630	61079	597	.8	49
12	75182	745	71167	703	67505	665	64140	630	61029	597	.8	48
13	75112	744	71104	703	67447	665	64086	629	60979	596	.8	47
14	75042	743	71040	702	67388	664	64032	629	60929	596	.8	46
15	74972	743	70976	701	67330	663	63978	628	60879	595	.8	45
16	74902	742	70913	701	67272	663	63925	628	60830	595	.7	44
17	74832	741	70850	700	67214	662	63871	627	60780	594	.7	43
18	74763	741	70786	699	67156	661	63818	626	60730	594	.7	42
19	74693	740	70723	699	67098	661	63764	626	60681	593	.7	41
20	74624	739	70660	698	67040	660	63711	625	60631	593	.7	40
21	74555	738	70597	697	66982	660	63658	625	60582	592	.7	39
22	74486	738	70534	697	66925	659	63605	624	60533	592	.6	38
23	74417	737	70471	696	66867	658	63551	624	60483	591	.6	37
24	74348	736	70409	695	66810	658	63498	623	60434	590	.6	36
25	74279	736	70346	695	66752	657	63445	622	60385	590	.6	35
26	74210	735	70284	694	66695	657	63392	622	60336	589	.6	34
27	74142	734	70221	693	66638	656	63340	621	60287	589	.6	33
28	74073	733	70159	693	66580	655	63287	621	60238	588	.5	32
29	74005	733	70097	692	66523	655	63234	620	60189	588	.5	31
30	73937	732	70034	692	66466	654	63181	620	60140	587	.5	30
31	73869	731	69972	691	66409	654	63129	619	60091	587	.5	29
32	73801	731	69910	690	66353	653	63076	619	60042	586	.5	28
33	73733	730	69849	690	66296	652	63024	618	59994	586	.5	27
34	73665	729	69787	689	66239	652	62972	617	59945	585	.4	26
35	73597	729	69725	688	66182	651	62919	617	59897	585	.4	25
36	73530	728	69664	688	66126	651	62867	616	59848	584	.4	24
37	73462	727	69602	687	66069	650	62815	616	59800	584	.4	23
38	73395	726	69541	686	66013	649	62763	615	59751	583	.4	22
39	73328	726	69479	686	65957	649	62711	615	59703	583	.4	21
40	73261	725	69418	685	65900	648	62659	614	59654	582	.3	20
41	73194	724	69357	684	65844	648	62607	614	59606	582	.3	19
42	73127	724	69296	684	65788	647	62555	613	59558	581	.3	18
43	73060	723	69235	683	65732	647	62503	612	59510	581	.3	17
44	72993	722	69174	683	65676	646	62451	612	59462	580	.3	16
45	72927	722	69113	682	65620	645	62400	611	59414	580	.3	15
46	72860	721	69053	681	65564	645	62348	611	59366	579	.2	14
47	72794	720	68992	681	65509	644	62297	610	59318	579	.2	13
48	72727	720	68932	680	65453	644	62245	610	59270	578	.2	12
49	72661	719	68871	679	65398	643	62194	609	59222	578	.2	11
50	72595	718	68811	679	65342	642	62142	609	59175	577	.2	10
51	72529	717	68750	678	65287	642	62091	608	59127	577	.2	9
52	72463	717	68690	678	65231	641	62040	608	59079	576	.1	8
53	72398	716	68630	677	65176	641	61989	607	59032	576	.1	7
54	72332	715	68570	676	65121	640	61938	606	58984	575	.1	6
55	72266	715	68510	676	65066	640	61887	606	58937	574	.1	5
56	72201	714	68451	675	65011	639	61836	605	58889	574	.1	4
57	72136	713	68391	674	64956	638	61785	605	58842	573	.1	3
58	72070	713	68331	674	64901	638	61734	604	58795	573	.0	2
59	72005	712	68272	673	64846	637	61683	604	58748	572	.0	1
60	71940	711	68212	673	64791	637	61632	603	58700	572	.0	0
	169°		168°		167°		166°		165°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	15°		16°		17°		18°		19°		Corr. Z″	
	h_c 15°	Z″ 74°	h_c 16°	Z″ 73°	h_c 17°	Z″ 72°	h_c 18°	Z″ 71°	h_c 19°	Z″ 70°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	58700	572	55966	543	53406	515	51002	488	48736	463	1.0	60
1	58653	571	55922	542	53365	514	50963	488	48699	463	1.0	59
2	58606	571	55878	542	53324	514	50924	487	48662	462	1.0	58
3	58559	570	55834	541	53283	513	50885	487	48626	462	1.0	57
4	58512	570	55790	541	53242	513	50847	487	48589	461	.9	56
5	58465	569	55747	540	53200	512	50808	486	48553	461	.9	55
6	58418	569	55703	540	53159	512	50769	486	48516	461	.9	54
7	58372	568	55659	539	53118	512	50731	485	48480	460	.9	53
8	58325	568	55615	539	53077	511	50692	485	48443	460	.9	52
9	58278	567	55572	538	53036	511	50653	484	48407	459	.9	51
10	58232	567	55528	538	52995	510	50615	484	48371	459	.8	50
11	58185	566	55484	537	52955	510	50576	484	48334	459	.8	49
12	58139	566	55441	537	52914	509	50538	483	48298	458	.8	48
13	58092	565	55398	536	52873	509	50500	483	48262	458	.8	47
14	58046	565	55354	536	52832	508	50461	482	48226	457	.8	46
15	57999	564	55311	535	52791	508	50423	482	48189	457	.8	45
16	57953	564	55267	535	52751	507	50385	481	48153	457	.7	44
17	57907	563	55224	534	52710	507	50346	481	48117	456	.7	43
18	57860	563	55181	534	52670	507	50308	481	48081	456	.7	42
19	57814	562	55138	534	52629	506	50270	480	48045	455	.7	41
20	57768	562	55095	533	52589	506	50232	480	48009	455	.7	40
21	57722	561	55052	533	52548	505	50194	479	47973	454	.7	39
22	57676	561	55008	532	52508	505	50156	479	47937	454	.6	38
23	57630	560	54965	532	52467	504	50118	478	47901	454	.6	37
24	57584	560	54923	531	52427	504	50080	478	47865	453	.6	36
25	57539	559	54880	531	52387	503	50042	478	47829	453	.6	35
26	57493	559	54837	530	52346	503	50004	477	47793	452	.6	34
27	57447	558	54794	530	52306	503	49966	477	47758	452	.6	33
28	57401	558	54751	529	52266	502	49928	476	47722	452	.5	32
29	57356	558	54708	529	52226	502	49890	476	47686	451	.5	31
30	57310	557	54666	528	52186	501	49852	475	47650	451	.5	30
31	57265	557	54623	528	52146	501	49815	475	47615	450	.5	29
32	57219	556	54581	527	52106	500	49777	475	47579	450	.5	28
33	57174	556	54538	527	52066	500	49739	474	47544	450	.5	27
34	57128	555	54496	527	52026	500	49702	474	47508	449	.4	26
35	57083	555	54453	526	51986	499	49664	473	47473	449	.4	25
36	57038	554	54411	526	51946	499	49626	473	47437	448	.4	24
37	56992	554	54368	525	51906	498	49589	473	47402	448	.4	23
38	56947	553	54326	525	51867	498	49551	472	47366	448	.4	22
39	56902	553	54284	524	51827	497	49514	472	47331	447	.4	21
40	56857	552	54242	524	51787	497	49477	471	47295	447	.3	20
41	56812	552	54199	523	51748	496	49439	471	47260	446	.3	19
42	56767	551	54157	523	51708	496	49402	470	47225	446	.3	18
43	56722	551	54115	522	51668	496	49365	470	47189	446	.3	17
44	56677	550	54073	522	51629	495	49327	470	47154	445	.3	16
45	56633	550	54031	521	51589	495	49290	469	47119	445	.3	15
46	56588	549	53989	521	51550	494	49253	469	47084	444	.2	14
47	56543	549	53947	521	51510	494	49216	468	47049	444	.2	13
48	56498	548	53905	520	51471	493	49179	468	47014	444	.2	12
49	56454	548	53864	520	51432	493	49142	468	46979	443	.2	11
50	56409	547	53822	519	51393	493	49104	467	46944	443	.2	10
51	56365	547	53780	519	51353	492	49067	467	46908	442	.2	9
52	56320	546	53738	518	51314	492	49030	466	46874	442	.1	8
53	56276	546	53697	518	51275	491	48993	466	46839	442	.1	7
54	56231	545	53655	517	51236	491	48957	466	46804	441	.1	6
55	56187	545	53614	517	51197	490	48920	465	46769	441	.1	5
56	56143	544	53572	516	51158	490	48883	465	46734	441	.1	4
57	56099	544	53531	516	51119	490	48846	464	46699	440	.1	3
58	56054	543	53489	516	51080	489	48809	464	46664	440	.0	2
59	56010	543	53448	515	51041	489	48773	463	46630	439	.0	1
60	55966	543	53406	515	51002	488	48736	463	46595	439	.0	0
	164°		163°		162°		161°		160°			

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	20°		21°		22°		23°		24°		Corr.	
	h_o 20°	Z″ 69°	h_o 21°	Z″ 68°	h_o 22°	Z″ 67°	h_o 23°	Z″ 66°	h_o 24°	Z″ 65°	Z″	
′	B	D	B	D	B	D	B	D	B	D	°	′
0	46595	439	44567	416	42642	394	40812	372	39069	351	1.0	60
1	46560	439	44534	415	42611	393	40782	372	39040	351	1.0	59
2	46525	438	44501	415	42580	393	40753	371	39012	351	1.0	58
3	46491	438	44468	415	42549	393	40723	371	38984	350	1.0	57
4	46456	437	44436	414	42518	392	40693	371	38955	350	.9	56
5	46422	437	44403	414	42486	392	40664	370	38927	350	.9	55
6	46387	437	44370	414	42455	391	40634	370	38899	349	.9	54
7	46353	436	44337	413	42424	391	40604	370	38871	349	.9	53
8	46318	436	44305	413	42393	391	40575	369	38842	349	.9	52
9	46284	435	44272	412	42362	390	40545	369	38814	348	.9	51
10	46249	435	44239	412	42331	390	40516	369	38786	348	.8	50
11	46215	435	44207	412	42300	390	40486	368	38758	348	.8	49
12	46181	434	44174	411	42269	389	40457	368	38730	347	.8	48
13	46146	434	44142	411	42238	389	40427	368	38702	347	.8	47
14	46112	433	44109	411	42207	389	40398	367	38674	347	.8	46
15	46078	433	44077	410	42176	388	40368	367	38646	346	.8	45
16	46043	433	44044	410	42145	388	40339	367	38618	346	.7	44
17	46009	432	44012	409	42115	387	40310	366	38589	346	.7	43
18	45975	432	43979	409	42084	387	40280	366	38562	345	.7	42
19	45941	432	43947	409	42053	387	40251	366	38534	345	.7	41
20	45907	431	43915	408	42022	386	40222	365	38506	345	.7	40
21	45873	431	43882	408	41992	386	40192	365	38478	344	.7	39
22	45839	430	43850	408	41961	386	40163	364	38450	344	.6	38
23	45805	430	43818	407	41930	385	40134	364	38422	344	.6	37
24	45771	430	43785	407	41899	385	40105	364	38394	343	.6	36
25	45737	429	43753	406	41869	385	40076	363	38366	343	.6	35
26	45703	429	43721	406	41838	384	40046	363	38338	343	.6	34
27	45669	428	43689	406	41808	384	40017	363	38311	342	.6	33
28	45635	428	43657	405	41777	383	39988	362	38283	342	.5	32
29	45601	428	43625	405	41747	383	39959	362	38255	342	.5	31
30	45567	427	43592	405	41716	383	39930	362	38227	341	.5	30
31	45534	427	43560	404	41686	382	39901	361	38200	341	.5	29
32	45500	426	43528	404	41655	382	39872	361	38172	341	.5	28
33	45466	426	43496	403	41625	382	39843	361	38144	340	.5	27
34	45433	426	43464	403	41594	381	39814	360	38117	340	.4	26
35	45399	425	43432	403	41564	381	39785	360	38089	340	.4	25
36	45365	425	43401	402	41533	381	39756	360	38061	339	.4	24
37	45332	425	43369	402	41503	380	39727	359	38034	339	.4	23
38	45298	424	43337	402	41473	380	39698	359	38006	339	.4	22
39	45265	424	43305	401	41443	380	39669	359	37979	338	.4	21
40	45231	423	43273	401	41412	379	39641	358	37951	338	.3	20
41	45198	423	43241	401	41382	379	39612	358	37924	338	.3	19
42	45164	423	43210	400	41352	379	39583	358	37896	337	.3	18
43	45131	422	43178	400	41322	378	39554	357	37869	337	.3	17
44	45097	422	43146	399	41291	378	39526	357	37841	337	.3	16
45	45064	422	43114	399	41261	377	39497	357	37814	336	.3	15
46	45031	421	43083	399	41231	377	39468	356	37786	336	.2	14
47	44997	421	43051	398	41201	377	39439	356	37759	336	.2	13
48	44964	420	43020	398	41171	376	39411	356	37732	335	.2	12
49	44931	420	42988	398	41141	376	39382	355	37704	335	.2	11
50	44898	420	42956	397	41111	376	39354	355	37677	335	.2	10
51	44864	419	42925	397	41081	375	39325	354	37650	334	.2	9
52	44831	419	42893	397	41051	375	39296	354	37623	334	.1	8
53	44798	418	42862	396	41021	375	39268	354	37595	334	.1	7
54	44765	418	42831	396	40991	374	39239	353	37568	333	.1	6
55	44732	418	42799	395	40961	374	39211	353	37541	333	.1	5
56	44699	417	42768	395	40931	374	39182	353	37514	333	.1	4
57	44666	417	42736	395	40902	373	39154	352	37487	332	.1	3
58	44633	417	42705	394	40872	373	39125	352	37459	332	.0	2
59	44600	416	42674	394	40842	373	39097	352	37432	332	.0	1
60	44567	416	42642	394	40812	372	39069	351	37405	331	.0	0
	159°		158°		157°		156°		155°			

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	25°		26°		27°		28°		29°		Corr. Z″	
	h_c 25°	Z″ 64°	h_c 26°	Z″ 63°	h_c 27°	Z″ 62°	h_c 28°	Z″ 61°	h_c 29°	Z″ 60°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	37405	331	35816	312	34295	293	32839	274	31443	256	1.0	60
1	37378	331	35790	312	34271	293	32815	274	31420	256	1.0	59
2	37351	331	35764	311	34246	292	32792	274	31397	256	1.0	58
3	37324	330	35738	311	34221	292	32768	273	31375	255	1.0	57
4	37297	330	35712	311	34196	292	32744	273	31352	255	.9	56
5	37270	330	35687	310	34172	291	32720	273	31329	255	.9	55
6	37243	329	35661	310	34147	291	32697	273	31306	254	.9	54
7	37216	329	35635	310	34122	291	32673	272	31284	254	.9	53
8	37189	329	35609	309	34098	290	32650	272	31261	254	.9	52
9	37162	328	35583	309	34073	290	32626	272	31238	254	.9	51
10	37135	328	35558	309	34048	290	32602	271	31216	253	.8	50
11	37108	328	35532	308	34024	289	32579	271	31193	253	.8	49
12	37082	327	35506	308	33999	289	32555	271	31171	253	.8	48
13	37055	327	35481	308	33975	289	32532	270	31148	252	.8	47
14	37028	327	35455	307	33950	288	32508	270	31125	252	.8	46
15	37001	326	35429	307	33925	288	32485	270	31103	252	.8	45
16	36974	326	35404	307	33901	288	32461	269	31080	251	.7	44
17	36948	326	35378	306	33876	288	32438	269	31058	251	.7	43
18	36921	325	35353	306	33852	287	32414	269	31035	251	.7	42
19	36894	325	35327	306	33827	287	32391	269	31013	251	.7	41
20	36867	325	35302	305	33803	287	32367	268	30990	250	.7	40
21	36841	324	35276	305	33779	286	32344	268	30968	250	.7	39
22	36814	324	35251	305	33754	286	32320	268	30945	250	.6	38
23	36787	324	35225	304	33730	286	32297	267	30923	249	.6	37
24	36761	323	35200	304	33705	285	32274	267	30900	249	.6	36
25	36734	323	35174	304	33681	285	32250	267	30878	249	.6	35
26	36708	323	35149	304	33657	285	32227	266	30856	249	.6	34
27	36681	322	35123	303	33632	284	32204	266	30833	248	.6	33
28	36655	322	35098	303	33608	284	32180	266	30811	248	.5	32
29	36628	322	35073	303	33584	284	32157	266	30788	248	.5	31
30	36602	322	35047	302	33559	284	32134	265	30766	247	.5	30
31	36575	321	35022	302	33535	283	32110	265	30744	247	.5	29
32	36549	321	34997	302	33511	283	32087	265	30721	247	.5	28
33	36522	321	34971	301	33487	283	32064	264	30699	246	.5	27
34	36496	320	34946	301	33463	282	32041	264	30677	246	.4	26
35	36469	320	34921	301	33438	282	32018	264	30655	246	.4	25
36	36443	320	34896	300	33414	282	31994	263	30632	246	.4	24
37	36417	319	34870	300	33390	281	31971	263	30610	245	.4	23
38	36390	319	34845	300	33366	281	31948	263	30588	245	.4	22
39	36364	319	34820	299	33342	281	31925	263	30566	245	.4	21
40	36338	318	34795	299	33318	280	31902	262	30544	244	.3	20
41	36311	318	34770	299	33294	280	31879	262	30521	244	.3	19
42	36285	318	34745	298	33269	280	31856	262	30499	244	.3	18
43	36259	317	34719	298	33245	280	31833	261	30477	244	.3	17
44	36233	317	34694	298	33221	279	31810	261	30455	243	.3	16
45	36206	317	34669	298	33197	279	31787	261	30433	243	.3	15
46	36180	316	34644	297	33173	279	31763	260	30411	243	.2	14
47	36154	316	34619	297	33149	278	31740	260	30389	242	.2	13
48	36128	316	34594	297	33125	278	31717	260	30367	242	.2	12
49	36102	315	34569	296	33101	278	31695	260	30345	242	.2	11
50	36076	315	34544	296	33078	277	31672	259	30323	241	.2	10
51	36050	315	34519	296	33054	277	31649	259	30301	241	.2	9
52	36024	314	34494	295	33030	277	31626	259	30279	241	.1	8
53	35998	314	34469	295	33006	276	31603	258	30257	241	.1	7
54	35972	314	34444	295	32982	276	31580	258	30235	240	.1	6
55	35946	313	34420	294	32958	276	31557	258	30213	240	.1	5
56	35920	313	34395	294	32934	276	31534	257	30191	240	.1	4
57	35894	313	34370	294	32910	275	31511	257	30169	239	.1	3
58	35868	312	34345	293	32887	275	31488	257	30147	239	.0	2
59	35842	312	34320	293	32863	275	31466	257	30125	239	.0	1
60	35816	312	34295	293	32839	274	31443	256	30103	239	.0	0
	154°		153°		152°		151°		150°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	30°		31°		32°		33°		34°		Corr. Z″	
	h_c 30°	Z″ 59°	h_c 31°	Z″ 58°	h_c 32°	Z″ 57°	h_c 33°	Z″ 56°	h_c 34°	Z″ 55°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	30103	239	28816	221	27579	204	26389	187	25244	171	1.0	60
1	30081	238	28795	221	27559	204	26370	187	25225	171	1.0	59
2	30059	238	28774	221	27539	204	26350	187	25206	170	1.0	58
3	30037	238	28753	220	27518	203	26331	187	25188	170	1.0	57
4	30016	237	28732	220	27498	203	26311	186	25169	170	.9	56
5	29994	237	28711	220	27478	203	26292	186	25150	170	.9	55
6	29972	237	28690	220	27458	203	26273	186	25132	169	.9	54
7	29950	237	28669	219	27438	202	26253	186	25113	169	.9	53
8	29928	236	28648	219	27418	202	26234	185	25094	169	.9	52
9	29907	236	28627	219	27398	202	26215	185	25076	169	.9	51
10	29885	236	28607	218	27378	201	26195	185	25057	168	.8	50
11	29863	235	28586	218	27357	201	26176	184	25039	168	.8	49
12	29841	235	28565	218	27337	201	26157	184	25020	168	.8	48
13	29820	235	28544	218	27317	201	26137	184	25001	167	.8	47
14	29798	234	28523	217	27297	200	26118	184	24983	167	.8	46
15	29776	234	28502	217	27277	200	26099	183	24964	167	.8	45
16	29755	234	28481	217	27257	200	26079	183	24946	167	.7	44
17	29733	234	28461	216	27237	199	26060	183	24927	166	.7	43
18	29712	233	28440	216	27217	199	26041	183	24909	166	.7	42
19	29690	233	28419	216	27197	199	26022	182	24890	166	.7	41
20	29668	233	28398	216	27177	199	26003	182	24872	166	.7	40
21	29647	232	28378	215	27157	198	25983	182	24853	165	.7	39
22	29625	232	28357	215	27137	198	25964	181	24835	165	.6	38
23	29604	232	28336	215	27117	198	25945	181	24816	165	.6	37
24	29582	232	28315	214	27098	197	25926	181	24798	164	.6	36
25	29561	231	28295	214	27078	197	25907	181	24779	164	.6	35
26	29539	231	28274	214	27058	197	25887	180	24761	164	.6	34
27	29518	231	28253	214	27038	197	25868	180	24742	164	.6	33
28	29496	230	28233	213	27018	196	25849	180	24724	163	.5	32
29	29475	230	28212	213	26998	196	25830	179	24706	163	.5	31
30	29453	230	28191	213	26978	196	25811	179	24687	163	.5	30
31	29432	230	28171	212	26959	196	25792	179	24669	163	.5	29
32	29410	229	28150	212	26939	195	25773	179	24650	162	.5	28
33	29389	229	28130	212	26919	195	25754	178	24632	162	.5	27
34	29367	229	28109	212	26899	195	25735	178	24614	162	.4	26
35	29346	228	28089	211	26879	194	25716	178	24595	162	.4	25
36	29325	228	28068	211	26860	194	25697	178	24577	161	.4	24
37	29303	228	28048	211	26840	194	25678	177	24559	161	.4	23
38	29282	228	28027	210	26820	194	25659	177	24541	161	.4	22
39	29261	227	28006	210	26800	193	25640	177	24522	160	.4	21
40	29239	227	27986	210	26781	193	25621	176	24504	160	.3	20
41	29218	227	27966	210	26761	193	25602	176	24486	160	.3	19
42	29197	226	27945	209	26741	192	25583	176	24467	160	.3	18
43	29176	226	27925	209	26722	192	25564	176	24449	159	.3	17
44	29154	226	27904	209	26702	192	25545	175	24431	159	.3	16
45	29133	226	27884	208	26682	192	25526	175	24413	159	.3	15
46	29112	225	27863	208	26663	191	25507	175	24395	159	.2	14
47	29091	225	27843	208	26643	191	25488	175	24376	158	.2	13
48	29069	225	27823	208	26623	191	25469	174	24358	158	.2	12
49	29048	224	27802	207	26604	191	25451	174	24340	158	.2	11
50	29027	224	27782	207	26584	190	25432	174	24322	157	.2	10
51	29006	224	27762	207	26565	190	25413	173	24304	157	.2	9
52	28985	224	27741	206	26545	190	25394	173	24286	157	.1	8
53	28964	223	27721	206	26526	189	25375	173	24267	157	.1	7
54	28942	223	27701	206	26506	189	25356	173	24249	156	.1	6
55	28921	223	27680	206	26487	189	25338	172	24231	156	.1	5
56	28900	222	27660	205	26467	189	25319	172	24213	156	.1	4
57	28879	222	27640	205	26448	188	25300	172	24195	156	.1	3
58	28858	222	27619	205	26428	188	25281	172	24177	155	.0	2
59	28837	222	27599	204	26409	188	25263	171	24159	155	.0	1
60	28816	221	27579	204	26389	187	25244	171	24141	155	.0	0
	149°		148°		147°		146°		145°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	35°		36°		37°		38°		39°		Corr.	
	h_c 35°	Z″ 54°	h_c 36°	Z″ 53°	h_c 37°	Z″ 52°	h_c 38°	Z″ 51°	h_c 39°	Z″ 50°	Corr. Z″	
′	B	D	B	D	B	D	B	D	B	D	°	′
0	24141	155	23078	139	22054	123	21066	107	20113	92	1.0	60
1	24123	155	23061	138	22037	123	21050	107	20097	91	1.0	59
2	24105	154	23043	138	22020	122	21033	107	20082	91	1.0	58
3	24087	154	23026	138	22003	122	21017	106	20066	91	1.0	57
4	24069	154	23009	138	21987	122	21001	106	20050	91	.9	56
5	24051	153	22991	137	21970	122	20985	106	20035	90	.9	55
6	24033	153	22974	137	21953	121	20969	106	20019	90	.9	54
7	24015	153	22957	137	21937	121	20953	105	20004	90	.9	53
8	23997	153	22939	137	21920	121	20937	105	19988	90	.9	52
9	23979	152	22922	136	21903	121	20921	105	19973	89	.9	51
10	23961	152	22905	136	21887	120	20905	105	19957	89	.8	50
11	23943	152	22888	136	21870	120	20889	104	19942	89	.8	49
12	23925	152	22870	136	21853	120	20872	104	19926	89	.8	48
13	23907	151	22853	135	21837	119	20856	104	19911	88	.8	47
14	23889	151	22836	135	21820	119	20840	104	19895	88	.8	46
15	23871	151	22819	135	21803	119	20824	103	19880	88	.8	45
16	23854	150	22801	134	21787	119	20808	103	19864	88	.7	44
17	23836	150	22784	134	21770	118	20792	103	19849	87	.7	43
18	23818	150	22767	134	21754	118	20776	103	19834	87	.7	42
19	23800	150	22750	134	21737	118	20760	102	19818	87	.7	41
20	23782	149	22732	133	21720	118	20744	102	19803	86	.7	40
21	23764	149	22715	133	21704	117	20728	102	19787	86	.7	39
22	23747	149	22698	133	21687	117	20712	101	19772	86	.6	38
23	23729	149	22681	133	21671	117	20696	101	19756	86	.6	37
24	23711	148	22664	132	21654	117	20681	101	19741	85	.6	36
25	23693	148	22647	132	21638	116	20665	101	19726	85	.6	35
26	23676	148	22630	132	21621	116	20649	100	19710	85	.6	34
27	23658	148	22613	132	21605	116	20633	100	19695	85	.6	33
28	23640	147	22595	131	21588	116	20617	100	19680	84	.5	32
29	23622	147	22578	131	21572	115	20601	100	19664	84	.5	31
30	23605	147	22561	131	21555	115	20585	99	19649	84	.5	30
31	23587	146	22544	131	21539	115	20569	99	19634	84	.5	29
32	23569	146	22527	130	21522	115	20553	99	19618	83	.5	28
33	23552	146	22510	130	21506	114	20537	99	19603	83	.5	27
34	23534	146	22493	130	21490	114	20522	98	19588	83	.4	26
35	23516	145	22476	129	21473	114	20506	98	19572	83	.4	25
36	23499	145	22459	129	21457	113	20490	98	19557	82	.4	24
37	23481	145	22442	129	21440	113	20474	98	19542	82	.4	23
38	23463	145	22425	129	21424	113	20458	97	19527	82	.4	22
39	23446	144	22408	128	21408	113	20442	97	19511	82	.4	21
40	23428	144	22391	128	21391	112	20427	97	19496	81	.3	20
41	23410	144	22374	128	21375	112	20411	97	19481	81	.3	19
42	23393	144	22357	128	21358	112	20395	96	19466	81	.3	18
43	23375	143	22340	127	21342	112	20379	96	19450	81	.3	17
44	23358	143	22323	127	21326	111	20364	96	19435	80	.3	16
45	23340	143	22306	127	21309	111	20348	96	19420	80	.3	15
46	23323	142	22289	127	21293	111	20332	95	19405	80	.2	14
47	23305	142	22272	126	21277	111	20316	95	19390	80	.2	13
48	23288	142	22256	126	21261	110	20301	95	19375	79	.2	12
49	23270	142	22239	126	21244	110	20285	94	19359	79	.2	11
50	23253	141	22222	126	21228	110	20269	94	19344	79	.2	10
51	23235	141	22205	125	21212	110	20254	94	19329	79	.2	9
52	23218	141	22188	125	21195	109	20238	94	19314	78	.1	8
53	23200	141	22171	125	21179	109	20222	93	19299	78	.1	7
54	23183	140	22154	124	21163	109	20207	93	19284	78	.1	6
55	23165	140	22138	124	21147	108	20191	93	19269	77	.1	5
56	23148	140	22121	124	21131	108	20175	93	19254	77	.1	4
57	23130	140	22104	124	21114	108	20160	92	19238	77	.1	3
58	23113	139	22087	123	21098	108	20144	92	19223	77	.0	2
59	23096	139	22070	123	21082	107	20128	92	19208	76	.0	1
60	23078	139	22054	123	21066	107	20113	92	19193	76	.0	0
	144°		143°		142°		141°		140°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	40°		41°		42°		43°		44°		Corr. Z″	
	h_c 40°	Z″ 49°	h_c 41°	Z″ 48°	h_c 42°	Z″ 47°	h_c 43°	Z″ 46°	h_c 44°	Z″ 45°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	19193	76	18306	61	17449	46	16622	30	15823	15	1.0	60
1	19178	76	18291	61	17435	45	16608	30	15810	15	1.0	59
2	19163	76	18277	60	17421	45	16595	30	15797	15	1.0	58
3	19148	75	18262	60	17407	45	16581	30	15784	14	1.0	57
4	19133	75	18248	60	17393	45	16568	29	15771	14	.9	56
5	19118	75	18233	60	17379	44	16554	29	15758	14	.9	55
6	19103	75	18219	59	17365	44	16541	29	15745	14	.9	54
7	19088	74	18204	59	17351	44	16527	29	15731	13	.9	53
8	19073	74	18190	59	17337	44	16514	28	15718	13	.9	52
9	19058	74	18175	59	17323	43	16500	28	15705	13	.9	51
10	19043	74	18161	58	17309	43	16487	28	15692	13	.8	50
11	19028	73	18146	58	17295	43	16473	28	15679	12	.8	49
12	19013	73	18132	58	17281	43	16460	27	15666	12	.8	48
13	18998	73	18118	58	17267	42	16446	27	15653	12	.8	47
14	18983	73	18103	57	17253	42	16433	27	15640	12	.8	46
15	18968	72	18089	57	17239	42	16419	27	15627	11	.8	45
16	18953	72	18074	57	17225	42	16406	26	15615	11	.7	44
17	18939	72	18060	57	17212	41	16392	26	15602	11	.7	43
18	18924	72	18045	56	17198	41	16379	26	15589	11	.7	42
19	18909	71	18031	56	17184	41	16366	26	15576	10	.7	41
20	18894	71	18017	56	17170	40	16352	25	15563	10	.7	40
21	18879	71	18002	55	17156	40	16339	25	15550	10	.7	39
22	18864	71	17988	55	17142	40	16326	25	15537	10	.6	38
23	18849	70	17974	55	17128	40	16312	25	15524	9	.6	37
24	18834	70	17959	55	17115	39	16299	24	15511	9	.6	36
25	18820	70	17945	54	17101	39	16285	24	15498	9	.6	35
26	18805	70	17931	54	17087	39	16272	24	15485	9	.6	34
27	18790	69	17916	54	17073	39	16259	24	15472	8	.6	33
28	18775	69	17902	54	17059	38	16245	23	15460	8	.5	32
29	18760	69	17888	53	17045	38	16232	23	15447	8	.5	31
30	18746	69	17874	53	17032	38	16219	23	15434	8	.5	30
31	18731	68	17859	53	17018	38	16205	23	15421	7	.5	29
32	18716	68	17845	53	17004	37	16192	22	15408	7	.5	28
33	18701	68	17831	52	16990	37	16179	22	15395	7	.5	27
34	18686	67	17816	52	16977	37	16166	22	15382	7	.4	26
35	18672	67	17802	52	16963	37	16152	21	15370	6	.4	25
36	18657	67	17788	52	16949	36	16139	21	15357	6	.4	24
37	18642	67	17774	51	16935	36	16126	21	15344	6	.4	23
38	18628	66	17760	51	16922	36	16113	21	15331	6	.4	22
39	18613	66	17745	51	16908	36	16099	20	15318	5	.4	21
40	18598	66	17731	51	16894	35	16086	20	15306	5	.3	20
41	18583	66	17717	50	16880	35	16073	20	15293	5	.3	19
42	18569	65	17703	50	16867	35	16060	20	15280	5	.3	18
43	18554	65	17689	50	16853	35	16046	19	15267	4	.3	17
44	18539	65	17674	50	16839	34	16033	19	15255	4	.3	16
45	18525	65	17660	49	16826	34	16020	19	15242	4	.3	15
46	18510	64	17646	49	16812	34	16007	19	15229	4	.2	14
47	18495	64	17632	49	16798	34	15994	18	15216	3	.2	13
48	18481	64	17618	49	16785	33	15980	18	15204	3	.2	12
49	18466	64	17604	48	16771	33	15967	18	15191	3	.2	11
50	18451	63	17590	48	16758	33	15954	18	15178	3	.2	10
51	18437	63	17576	48	16744	33	15941	17	15165	2	.2	9
52	18422	63	17561	48	16730	32	15928	17	15153	2	.1	8
53	18408	63	17547	47	16717	32	15915	17	15140	2	.1	7
54	18393	62	17533	47	16703	32	15902	17	15127	2	.1	6
55	18378	62	17519	47	16690	32	15888	16	15115	1	.1	5
56	18364	62	17505	47	16676	31	15875	16	15102	1	.1	4
57	18349	62	17491	46	16662	31	15862	16	15089	1	.1	3
58	18335	61	17477	46	16649	31	15849	16	15077	1	.0	2
59	18320	61	17463	46	16635	31	15836	15	15064	0	.0	1
60	18306	61	17449	46	16622	30	15823	15	15051	0	.0	0
	139°		138°		137°		136°		135°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	45°		46°		47°		48°		49°		Corr. Z″	
	h_c 45°	Z″ 44°	h_c 46°	Z″ 43°	h_c 47°	Z″ 42°	h_c 48°	Z″ 41°	h_c 49°	Z″ 40°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	15051	0000	14307	9985	13587	9970	12893	9954	12222	9939	1.0	60
1	15039	0000	14294	9985	13575	9969	12881	9954	12211	9939	1.0	59
2	15026	9999	14282	9984	13564	9969	12870	9954	12200	9939	1.0	58
3	15014	9999	14270	9984	13552	9969	12859	9954	12189	9938	1.0	57
4	15001	9999	14258	9984	13540	9969	12847	9953	12178	9938	.9	56
5	14988	9999	14246	9984	13528	9968	12836	9953	12167	9938	.9	55
6	14976	9998	14234	9983	13517	9968	12825	9953	12156	9938	.9	54
7	14963	9998	14221	9983	13505	9968	12813	9953	12145	9937	.9	53
8	14951	9998	14209	9983	13493	9968	12802	9952	12134	9937	.9	52
9	14938	9998	14197	9983	13482	9967	12791	9952	12123	9937	.9	51
10	14926	9997	14185	9982	13470	9967	12779	9952	12113	9937	.8	50
11	14913	9997	14173	9982	13458	9967	12768	9952	12102	9936	.8	49
12	14900	9997	14161	9982	13446	9967	12757	9951	12091	9936	.8	48
13	14888	9997	14149	9982	13435	9966	12745	9951	12080	9936	.8	47
14	14875	9996	14136	9981	13423	9966	12734	9951	12069	9936	.8	46
15	14863	9996	14124	9981	13411	9966	12723	9951	12058	9935	.8	45
16	14850	9996	14112	9981	13400	9966	12712	9950	12047	9935	.7	44
17	14838	9996	14100	9981	13388	9965	12700	9950	12036	9935	.7	43
18	14825	9995	14088	9980	13376	9965	12689	9950	12025	9935	.7	42
19	14813	9995	14076	9980	13365	9965	12678	9950	12015	9934	.7	41
20	14800	9995	14064	9980	13353	9965	12666	9949	12004	9934	.7	40
21	14788	9995	14052	9980	13341	9964	12655	9949	11993	9934	.7	39
22	14775	9994	14040	9979	13330	9964	12644	9949	11982	9934	.6	38
23	14763	9994	14028	9979	13318	9964	12633	9949	11971	9933	.6	37
24	14750	9994	14016	9979	13306	9964	12622	9948	11960	9933	.6	36
25	14738	9994	14004	9979	13295	9963	12610	9948	11949	9933	.6	35
26	14726	9993	13992	9978	13283	9963	12599	9948	11939	9933	.6	34
27	14713	9993	13980	9978	13272	9963	12588	9948	11928	9932	.6	33
28	14701	9993	13968	9978	13260	9963	12577	9947	11917	9932	.5	32
29	14688	9993	13956	9978	13248	9962	12566	9947	11906	9932	.5	31
30	14676	9992	13944	9977	13237	9962	12554	9947	11895	9932	.5	30
31	14663	9992	13932	9977	13225	9962	12543	9947	11885	9931	.5	29
32	14651	9992	13920	9977	13214	9962	12532	9946	11874	9931	.5	28
33	14639	9992	13908	9976	13202	9961	12521	9946	11863	9931	.5	27
34	14626	9991	13896	9976	13191	9961	12510	9946	11852	9930	.4	26
35	14614	9991	13884	9976	13179	9961	12499	9946	11842	9930	.4	25
36	14601	9991	13872	9976	13168	9961	12487	9945	11831	9930	.4	24
37	14589	9991	13860	9975	13156	9960	12476	9945	11820	9930	.4	23
38	14577	9990	13848	9975	13145	9960	12465	9945	11809	9929	.4	22
39	14564	9990	13836	9975	13133	9960	12454	9945	11799	9929	.4	21
40	14552	9990	13824	9975	13121	9960	12443	9944	11788	9929	.3	20
41	14540	9990	13812	9974	13110	9959	12432	9944	11777	9929	.3	19
42	14527	9989	13800	9974	13098	9959	12421	9944	11766	9928	.3	18
43	14515	9989	13789	9974	13087	9959	12410	9944	11756	9928	.3	17
44	14503	9989	13777	9974	13076	9959	12399	9943	11745	9928	.3	16
45	14490	9989	13765	9973	13064	9958	12387	9943	11734	9928	.3	15
46	14478	9988	13753	9973	13053	9958	12376	9943	11724	9927	.2	14
47	14466	9988	13741	9973	13041	9958	12365	9942	11713	9927	.2	13
48	14453	9988	13729	9973	13030	9957	12354	9942	11702	9927	.2	12
49	14441	9988	13717	9972	13018	9957	12343	9942	11692	9927	.2	11
50	14429	9987	13705	9972	13007	9957	12332	9942	11681	9926	.2	10
51	14417	9987	13694	9972	12995	9957	12321	9941	11670	9926	.2	9
52	14404	9987	13682	9972	12984	9956	12310	9941	11660	9926	.1	8
53	14392	9987	13670	9971	12972	9956	12299	9941	11649	9926	.1	7
54	14380	9986	13658	9971	12961	9956	12288	9941	11638	9925	.1	6
55	14368	9986	13646	9971	12950	9956	12277	9940	11628	9925	.1	5
56	14355	9986	13634	9971	12938	9955	12266	9940	11617	9925	.1	4
57	14343	9986	13623	9970	12927	9955	12255	9940	11606	9925	.1	3
58	14331	9985	13611	9970	12915	9955	12244	9940	11596	9924	.0	2
59	14319	9985	13599	9970	12904	9955	12233	9939	11585	9924	.0	1
60	14307	9985	13587	9970	12893	9954	12222	9939	11575	9924	.0	0
	134°		133°		132°		131°		130°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	50°		51°		52°		53°		54°		Corr.	
	h_c 50°	Z″ 39°	h_c 51°	Z″ 38°	h_c 52°	Z″ 37°	h_c 53°	Z″ 36°	h_c 54°	Z″ 35°	Z″	
′	B	D	B	D	B	D	B	D	B	D	°	′
0	11575	9924	10950	9908	10347	9893	9765	9877	9204	9861	1.0	60
1	11564	9924	10940	9908	10337	9893	9756	9877	9195	9861	1.0	59
2	11553	9923	10929	9908	10327	9892	9746	9877	9186	9861	1.0	58
3	11543	9923	10919	9908	10317	9892	9737	9876	9177	9860	1.0	57
4	11532	9923	10909	9907	10307	9892	9727	9876	9168	9860	.9	56
5	11522	9923	10899	9907	10298	9892	9718	9876	9158	9860	.9	55
6	11511	9922	10888	9907	10288	9891	9708	9876	9149	9860	.9	54
7	11501	9922	10878	9907	10278	9891	9699	9875	9140	9859	.9	53
8	11490	9922	10868	9906	10268	9891	9689	9875	9131	9859	.9	52
9	11479	9922	10858	9906	10258	9890	9680	9875	9122	9859	.9	51
10	11469	9921	10848	9906	10248	9890	9670	9874	9113	9859	.8	50
11	11458	9921	10838	9906	10239	9890	9661	9874	9104	9858	.8	49
12	11448	9921	10827	9905	10229	9890	9651	9874	9094	9858	.8	48
13	11437	9920	10817	9905	10219	9889	9642	9874	9085	9858	.8	47
14	11427	9920	10807	9905	10209	9889	9632	9873	9076	9858	.8	46
15	11416	9920	10797	9904	10199	9889	9623	9873	9067	9857	.8	45
16	11406	9920	10787	9904	10190	9889	9614	9873	9058	9857	.7	44
17	11395	9919	10777	9904	10180	9888	9604	9873	9049	9857	.7	43
18	11385	9919	10767	9904	10170	9888	9595	9872	9040	9856	.7	42
19	11374	9919	10756	9903	10160	9888	9585	9872	9031	9856	.7	41
20	11364	9919	10746	9903	10151	9888	9576	9872	9022	9856	.7	40
21	11353	9918	10736	9903	10141	9887	9566	9872	9013	9856	.7	39
22	11343	9918	10726	9903	10131	9887	9557	9871	9004	9855	.6	38
23	11332	9918	10716	9902	10121	9887	9548	9871	8995	9855	.6	37
24	11322	9918	10706	9902	10112	9887	9538	9871	8986	9855	.6	36
25	11312	9917	10696	9902	10102	9886	9529	9871	8977	9855	.6	35
26	11301	9917	10686	9902	10092	9886	9520	9870	8967	9854	.6	34
27	11291	9917	10676	9901	10082	9886	9510	9870	8958	9854	.6	33
28	11280	9917	10666	9901	10073	9886	9501	9870	8949	9854	.5	32
29	11270	9916	10656	9901	10063	9885	9491	9869	8940	9854	.5	31
30	11259	9916	10646	9901	10053	9885	9482	9869	8931	9853	.5	30
31	11249	9916	10636	9900	10044	9885	9473	9869	8922	9853	.5	29
32	11239	9916	10625	9900	10034	9884	9463	9869	8913	9853	.5	28
33	11228	9915	10615	9900	10024	9884	9454	9868	8904	9852	.5	27
34	11218	9915	10605	9900	10015	9884	9445	9868	8895	9852	.4	26
35	11207	9915	10595	9899	10005	9884	9435	9868	8886	9852	.4	25
36	11197	9915	10585	9899	9995	9883	9426	9868	8877	9852	.4	24
37	11187	9914	10575	9899	9986	9883	9417	9867	8868	9851	.4	23
38	11176	9914	10565	9899	9976	9883	9408	9867	8859	9851	.4	22
39	11166	9914	10555	9898	9966	9883	9398	9867	8851	9851	.4	21
40	11156	9914	10545	9898	9957	9882	9389	9867	8842	9851	.3	20
41	11145	9913	10535	9898	9947	9882	9380	9866	8833	9850	.3	19
42	11135	9913	10525	9897	9937	9882	9370	9866	8824	9850	.3	18
43	11125	9913	10515	9897	9928	9882	9361	9866	8815	9850	.3	17
44	11114	9913	10505	9897	9918	9881	9352	9866	8806	9850	.3	16
45	11104	9912	10496	9897	9909	9881	9343	9865	8797	9849	.3	15
46	11094	9912	10486	9896	9899	9881	9333	9865	8788	9849	.2	14
47	11083	9912	10476	9896	9889	9881	9324	9865	8779	9849	.2	13
48	11073	9911	10466	9896	9880	9880	9315	9864	8770	9848	.2	12
49	11063	9911	10456	9896	9870	9880	9306	9864	8761	9848	.2	11
50	11052	9911	10446	9895	9861	9880	9296	9864	8752	9848	.2	10
51	11042	9911	10436	9895	9851	9879	9287	9864	8743	9848	.2	9
52	11032	9910	10426	9895	9841	9879	9278	9863	8734	9847	.1	8
53	11022	9910	10416	9895	9832	9879	9269	9863	8726	9847	.1	7
54	11011	9910	10406	9894	9822	9879	9259	9863	8717	9847	.1	6
55	11001	9910	10396	9894	9813	9878	9250	9863	8708	9847	.1	5
56	10991	9909	10386	9894	9803	9878	9241	9862	8699	9846	.1	4
57	10980	9909	10376	9894	9794	9878	9232	9862	8690	9846	.1	3
58	10970	9909	10367	9893	9784	9878	9223	9862	8681	9846	.0	2
59	10960	9909	10357	9893	9775	9877	9213	9862	8672	9846	.0	1
60	10950	9908	10347	9893	9765	9877	9204	9861	8664	9845	.0	0
	129°		128°		127°		126°		125°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	55°		56°		57°		58°		59°		Corr. Z″	
	h_c 55°	Z″ 34°	h_c 56°	Z″ 33°	h_c 57°	Z″ 32°	h_c 58°	Z″ 31°	h_c 59°	Z″ 30°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	8664	9845	8143	9829	7641	9813	7158	9796	6693	9779	1.0	60
1	8655	9845	8134	9829	7633	9812	7150	9796	6686	9778	1.0	59
2	8646	9845	8126	9828	7624	9812	7142	9795	6678	9778	1.0	58
3	8637	9844	8117	9828	7616	9812	7134	9795	6671	9778	1.0	57
4	8628	9844	8109	9828	7608	9811	7126	9795	6663	9778	.9	56
5	8619	9844	8100	9828	7600	9811	7119	9794	6656	9777	.9	55
6	8611	9844	8092	9827	7592	9811	7111	9794	6648	9777	.9	54
7	8602	9843	8083	9827	7584	9811	7103	9794	6640	9777	.9	53
8	8593	9843	8075	9827	7575	9810	7095	9794	6633	9776	.9	52
9	8584	9843	8066	9827	7567	9810	7087	9793	6625	9776	.9	51
10	8575	9843	8058	9826	7559	9810	7079	9793	6618	9776	.8	50
11	8567	9842	8049	9826	7551	9809	7071	9793	6610	9776	.8	49
12	8558	9842	8041	9826	7543	9809	7064	9792	6603	9775	.8	48
13	8549	9842	8032	9825	7535	9809	7056	9792	6595	9775	.8	47
14	8540	9841	8024	9825	7527	9809	7048	9792	6588	9775	.8	46
15	8531	9841	8015	9825	7518	9808	7040	9792	6580	9774	.8	45
16	8523	9841	8007	9825	7510	9808	7032	9791	6573	9774	.7	44
17	8514	9841	7998	9824	7502	9808	7024	9791	6565	9774	.7	43
18	8505	9840	7990	9824	7494	9808	7017	9791	6558	9774	.7	42
19	8496	9840	7982	9824	7486	9807	7009	9790	6550	9773	.7	41
20	8488	9840	7973	9824	7478	9807	7001	9790	6543	9773	.7	40
21	8479	9840	7965	9823	7470	9807	6993	9790	6535	9773	.7	39
22	8470	9839	7956	9823	7462	9806	6986	9790	6528	9772	.6	38
23	8462	9839	7948	9823	7454	9806	6978	9789	6520	9772	.6	37
24	8453	9839	7940	9822	7445	9806	6970	9789	6513	9772	.6	36
25	8444	9838	7931	9822	7437	9806	6962	9789	6505	9772	.6	35
26	8435	9838	7923	9822	7429	9805	6954	9788	6498	9771	.6	34
27	8427	9838	7914	9822	7421	9805	6947	9788	6490	9771	.6	33
28	8418	9838	7906	9821	7413	9805	6939	9788	6483	9771	.5	32
29	8409	9837	7898	9821	7405	9804	6931	9788	6475	9770	.5	31
30	8401	9837	7889	9821	7397	9804	6923	9787	6468	9770	.5	30
31	8392	9837	7881	9821	7389	9804	6916	9787	6461	9770	.5	29
32	8383	9837	7873	9820	7381	9804	6908	9787	6453	9770	.5	28
33	8375	9836	7864	9820	7373	9803	6900	9786	6446	9769	.5	27
34	8366	9836	7856	9820	7365	9803	6892	9786	6438	9769	.4	26
35	8357	9836	7848	9819	7357	9803	6885	9786	6431	9769	.4	25
36	8349	9836	7839	9819	7349	9803	6877	9786	6423	9768	.4	24
37	8340	9835	7831	9819	7341	9802	6869	9785	6416	9768	.4	23
38	8331	9835	7823	9819	7333	9802	6862	9785	6409	9768	.4	22
39	8323	9835	7814	9818	7325	9802	6854	9785	6401	9768	.4	21
40	8314	9834	7805	9818	7317	9801	6846	9784	6394	9767	.3	20
41	8305	9834	7798	9818	7309	9801	6839	9784	6386	9767	.3	19
42	8297	9834	7789	9817	7301	9801	6831	9784	6379	9767	.3	18
43	8288	9834	7781	9817	7293	9801	6823	9784	6372	9766	.3	17
44	8280	9833	7773	9817	7285	9800	6816	9783	6364	9766	.3	16
45	8271	9833	7765	9817	7277	9800	6808	9783	6357	9766	.3	15
46	8262	9833	7756	9816	7269	9800	6800	9783	6350	9766	.2	14
47	8254	9833	7748	9816	7261	9799	6793	9782	6342	9765	.2	13
48	8245	9832	7740	9816	7253	9799	6785	9782	6335	9765	.2	12
49	8237	9832	7731	9816	7245	9799	6777	9782	6327	9765	.2	11
50	8228	9832	7723	9815	7237	9799	6770	9782	6320	9764	.2	10
51	8219	9831	7715	9815	7229	9798	6762	9781	6313	9764	.2	9
52	8211	9831	7707	9815	7221	9798	6754	9781	6305	9764	.1	8
53	8202	9831	7698	9814	7213	9798	6747	9781	6298	9763	.1	7
54	8194	9831	7690	9814	7205	9797	6739	9780	6291	9763	.1	6
55	8185	9830	7682	9814	7197	9797	6731	9780	6283	9763	.1	5
56	8177	9830	7674	9814	7190	9797	6724	9780	6276	9763	.1	4
57	8168	9830	7665	9813	7182	9797	6716	9780	6269	9762	.1	3
58	8160	9830	7657	9813	7174	9796	6709	9779	6262	9762	.0	2
59	8151	9829	7649	9813	7166	9796	6701	9779	6254	9762	.0	1
60	8143	9829	7641	9813	7158	9796	6693	9779	6247	9761	.0	0
	124°		123°		122°		121°		120°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

′	60°		61°		62°		63°		64°		Corr. Z″	′
	h_c 60°	Z″ 29°	h_c 61°	Z″ 28°	h_c 62°	Z″ 27°	h_c 63°	Z″ 26°	h_c 64°	Z″ 25°		
	B	D	B	D	B	D	B	D	B	D	°	
0	6247	9761	5818	9744	5407	9726	5012	9707	4634	9688	1.0	60
1	6240	9761	5811	9743	5400	9725	5005	9707	4628	9688	1.0	59
2	6232	9761	5804	9743	5393	9725	4999	9707	4622	9688	1.0	58
3	6225	9761	5797	9743	5386	9725	4993	9706	4616	9687	1.0	57
4	6218	9760	5790	9743	5380	9724	4986	9706	4609	9687	.9	56
5	6211	9760	5783	9742	5373	9724	4980	9706	4603	9687	.9	55
6	6203	9760	5776	9742	5366	9724	4973	9705	4597	9686	.9	54
7	6196	9759	5769	9742	5360	9724	4967	9705	4591	9686	.9	53
8	6189	9759	5762	9741	5353	9723	4961	9705	4585	9686	.9	52
9	6181	9759	5755	9741	5346	9723	4954	9704	4579	9685	.9	51
10	6174	9759	5748	9741	5340	9723	4948	9704	4573	9685	.8	50
11	6167	9758	5741	9740	5333	9722	4941	9704	4566	9685	.8	49
12	6160	9758	5734	9740	5326	9722	4935	9703	4560	9684	.8	48
13	6153	9758	5727	9740	5320	9722	4929	9703	4554	9684	.8	47
14	6145	9757	5721	9740	5313	9721	4922	9703	4548	9684	.8	46
15	6138	9757	5714	9739	5306	9721	4916	9702	4542	9683	.8	45
16	6131	9757	5707	9739	5300	9721	4910	9702	4536	9683	.7	44
17	6124	9756	5700	9739	5293	9720	4903	9702	4530	9683	.7	43
18	6116	9756	5693	9738	5286	9720	4897	9702	4524	9682	.7	42
19	6109	9756	5686	9738	5280	9720	4890	9701	4518	9682	.7	41
20	6102	9756	5679	9738	5273	9720	4884	9701	4512	9682	.7	40
21	6095	9755	5672	9737	5266	9719	4878	9701	4506	9681	.7	39
22	6088	9755	5665	9737	5260	9719	4871	9700	4500	9681	.6	38
23	6080	9755	5658	9737	5253	9719	4865	9700	4493	9681	.6	37
24	6073	9754	5651	9737	5247	9718	4859	9700	4487	9680	.6	36
25	6066	9754	5645	9736	5240	9718	4852	9699	4481	9680	.6	35
26	6059	9754	5638	9736	5233	9718	4846	9699	4475	9680	.6	34
27	6052	9754	5631	9736	5227	9717	4840	9699	4469	9679	.6	33
28	6045	9753	5624	9735	5220	9717	4833	9698	4463	9679	.5	32
29	6037	9753	5617	9735	5214	9717	4827	9698	4457	9679	.5	31
30	6030	9753	5610	9735	5207	9716	4821	9698	4451	9679	.5	30
31	6023	9752	5603	9734	5201	9716	4815	9697	4445	9678	.5	29
32	6016	9752	5596	9734	5194	9716	4808	9697	4439	9678	.5	28
33	6009	9752	5590	9734	5187	9716	4802	9697	4433	9678	.5	27
34	6002	9751	5583	9734	5181	9715	4796	9696	4427	9677	.4	26
35	5995	9751	5576	9733	5174	9715	4789	9696	4421	9677	.4	25
36	5988	9751	5569	9733	5168	9715	4783	9696	4415	9677	.4	24
37	5980	9751	5562	9733	5161	9714	4777	9696	4409	9676	.4	23
38	5973	9750	5555	9732	5155	9714	4771	9695	4403	9676	.4	22
39	5966	9750	5549	9732	5148	9714	4764	9695	4397	9676	.4	21
40	5959	9750	5542	9732	5142	9713	4758	9695	4391	9675	.3	20
41	5952	9749	5535	9731	5135	9713	4752	9694	4385	9675	.3	19
42	5945	9749	5528	9731	5129	9713	4746	9694	4379	9675	.3	18
43	5938	9749	5521	9731	5122	9712	4739	9694	4373	9674	.3	17
44	5931	9749	5515	9731	5115	9712	4733	9693	4367	9674	.3	16
45	5924	9748	5508	9730	5109	9712	4727	9693	4361	9674	.3	15
46	5917	9748	5501	9730	5102	9712	4721	9693	4355	9673	.2	14
47	5910	9748	5494	9730	5096	9711	4714	9692	4349	9673	.2	13
48	5902	9747	5487	9729	5089	9711	4708	9692	4343	9673	.2	12
49	5895	9747	5481	9729	5083	9711	4702	9692	4337	9672	.2	11
50	5888	9747	5474	9729	5077	9710	4696	9691	4332	9672	.2	10
51	5881	9746	5467	9728	5070	9710	4690	9691	4326	9672	.2	9
52	5874	9746	5460	9728	5064	9710	4683	9691	4320	9671	.1	8
53	5867	9746	5454	9728	5057	9709	4677	9690	4314	9671	.1	7
54	5860	9746	5447	9728	5051	9709	4671	9690	4308	9671	.1	6
55	5853	9745	5440	9727	5044	9709	4665	9690	4302	9670	.1	5
56	5846	9745	5433	9727	5038	9708	4659	9689	4296	9670	.1	4
57	5839	9745	5427	9727	5031	9708	4652	9689	4290	9670	.1	3
58	5832	9744	5420	9726	5025	9708	4646	9689	4284	9669	.0	2
59	5825	9744	5413	9726	5018	9707	4640	9689	4278	9669	.0	1
60	5818	9744	5407	9726	5012	9707	4634	9688	4272	9669	.0	0
	119°		118°		117°		116°		115°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	65°		66°		67°		68°		69°		Corr. Z″	
	h_c 65°	Z″ 24°	h_c 66°	Z″ 23°	h_c 67°	Z″ 22°	h_c 68°	Z″ 21°	h_c 69°	Z″ 20°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	4272	9669	3927	9649	3597	9628	3283	9606	2985	9584	1.0	60
1	4267	9668	3921	9648	3592	9628	3278	9606	2980	9584	1.0	59
2	4261	9668	3916	9648	3587	9627	3273	9606	2975	9583	1.0	58
3	4255	9668	3910	9648	3581	9627	3268	9605	2970	9583	1.0	57
4	4249	9667	3905	9647	3576	9626	3263	9605	2965	9583	.9	56
5	4243	9667	3899	9647	3571	9626	3258	9605	2961	9582	.9	55
6	4237	9667	3893	9647	3565	9626	3253	9604	2956	9582	.9	54
7	4231	9666	3888	9646	3560	9625	3248	9604	2951	9582	.9	53
8	4225	9666	3882	9646	3555	9625	3243	9603	2946	9581	.9	52
9	4220	9666	3877	9646	3549	9625	3238	9603	2941	9581	.9	51
10	4214	9665	3871	9645	3544	9624	3233	9603	2937	9580	.8	50
11	4208	9665	3865	9645	3539	9624	3228	9602	2932	9580	.8	49
12	4202	9665	3860	9644	3533	9624	3222	9602	2927	9580	.8	48
13	4196	9664	3854	9644	3528	9623	3217	9602	2922	9579	.8	47
14	4190	9664	3849	9644	3523	9623	3212	9601	2917	9579	.8	46
15	4185	9664	3843	9643	3517	9623	3207	9601	2913	9578	.8	45
16	4179	9663	3838	9643	3512	9622	3202	9601	2908	9578	.7	44
17	4173	9663	3832	9643	3507	9622	3197	9600	2903	9578	.7	43
18	4167	9663	3826	9642	3502	9622	3192	9600	2898	9577	.7	42
19	4161	9662	3821	9642	3496	9621	3187	9599	2893	9577	.7	41
20	4156	9662	3815	9642	3491	9621	3182	9599	2889	9577	.7	40
21	4150	9662	3810	9641	3486	9620	3177	9599	2884	9576	.7	39
22	4144	9661	3804	9641	3480	9620	3172	9598	2879	9576	.6	38
23	4138	9661	3799	9641	3475	9620	3167	9598	2874	9575	.6	37
24	4132	9661	3793	9640	3470	9619	3162	9598	2870	9575	.6	36
25	4127	9660	3788	9640	3465	9619	3157	9597	2865	9575	.6	35
26	4121	9660	3782	9640	3459	9619	3152	9597	2860	9574	.6	34
27	4115	9660	3777	9639	3454	9618	3147	9597	2855	9574	.6	33
28	4109	9659	3771	9639	3449	9618	3142	9596	2851	9574	.5	32
29	4103	9659	3766	9639	3444	9618	3137	9596	2846	9573	.5	31
30	4098	9659	3760	9638	3438	9617	3132	9595	2841	9573	.5	30
31	4092	9658	3755	9638	3433	9617	3127	9595	2837	9572	.5	29
32	4086	9658	3749	9638	3428	9617	3122	9595	2832	9572	.5	28
33	4080	9658	3744	9637	3423	9616	3117	9594	2827	9572	.5	27
34	4075	9657	3738	9637	3418	9616	3112	9594	2822	9571	.4	26
35	4069	9657	3733	9637	3412	9615	3107	9594	2818	9571	.4	25
36	4063	9657	3727	9636	3407	9615	3102	9593	2813	9570	.4	24
37	4058	9656	3722	9636	3402	9615	3097	9593	2808	9570	.4	23
38	4052	9656	3716	9636	3397	9614	3093	9592	2804	9570	.4	22
39	4046	9656	3711	9635	3392	9614	3088	9592	2799	9569	.4	21
40	4040	9655	3706	9635	3386	9614	3083	9592	2794	9569	.3	20
41	4035	9655	3700	9634	3381	9613	3078	9591	2790	9568	.3	19
42	4029	9655	3695	9634	3376	9613	3073	9591	2785	9568	.3	18
43	4023	9654	3689	9634	3371	9613	3068	9591	2780	9568	.3	17
44	4018	9654	3684	9633	3366	9612	3063	9590	2776	9567	.3	16
45	4012	9654	3678	9633	3360	9612	3058	9590	2771	9567	.3	15
46	4006	9653	3673	9633	3355	9611	3053	9589	2766	9567	.2	14
47	4000	9653	3667	9632	3350	9611	3048	9589	2762	9566	.2	13
48	3995	9653	3662	9632	3345	9611	3043	9589	2757	9566	.2	12
49	3989	9652	3657	9632	3340	9610	3038	9588	2752	9565	.2	11
50	3983	9652	3651	9631	3335	9610	3034	9588	2748	9565	.2	10
51	3978	9652	3646	9631	3330	9610	3029	9588	2743	9565	.2	9
52	3972	9651	3640	9631	3324	9609	3024	9587	2738	9564	.1	8
53	3966	9651	3635	9630	3319	9609	3019	9587	2734	9564	.1	7
54	3961	9651	3630	9630	3314	9609	3014	9586	2729	9563	.1	6
55	3955	9650	3624	9630	3309	9608	3009	9586	2724	9563	.1	5
56	3950	9650	3619	9629	3304	9608	3004	9586	2720	9563	.1	4
57	3944	9650	3613	9629	3299	9608	2999	9585	2715	9562	.1	3
58	3938	9649	3608	9629	3294	9607	2995	9585	2711	9562	.0	2
59	3933	9649	3603	9628	3289	9607	2990	9585	2706	9561	.0	1
60	3927	9649	3597	9628	3283	9606	2985	9584	2701	9561	.0	0
	114°		113°		112°		111°		110°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	70°		71°		72°		73°		74°		Corr. Z″	
	h_o 70°	Z″ 19°	h_o 71°	Z″ 18°	h_o 72°	Z″ 17°	h_o 73°	Z″ 16°	h_o 74°	Z″ 15°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	2701	9561	2433	9537	2179	9512	1940	9485	1716	9458	1.0	60
1	2697	9561	2429	9537	2175	9511	1937	9485	1712	9457	1.0	59
2	2692	9560	2424	9536	2171	9511	1933	9484	1709	9457	1.0	58
3	2688	9560	2420	9536	2167	9510	1929	9484	1705	9456	1.0	57
4	2683	9559	2416	9535	2163	9510	1925	9484	1701	9456	.9	56
5	2678	9559	2411	9535	2159	9510	1921	9483	1698	9455	.9	55
6	2674	9559	2407	9535	2155	9509	1917	9483	1694	9455	.9	54
7	2669	9558	2403	9534	2151	9509	1913	9482	1691	9454	.9	53
8	2665	9558	2398	9534	2147	9508	1910	9482	1687	9454	.9	52
9	2660	9558	2394	9533	2143	9508	1906	9481	1683	9453	.9	51
10	2656	9557	2390	9533	2139	9507	1902	9481	1680	9453	.8	50
11	2651	9557	2385	9532	2134	9507	1898	9480	1676	9452	.8	49
12	2647	9556	2381	9532	2130	9507	1894	9480	1673	9452	.8	48
13	2642	9556	2377	9532	2126	9506	1890	9479	1669	9451	.8	47
14	2637	9556	2372	9531	2122	9506	1887	9479	1666	9451	.8	46
15	2633	9555	2368	9531	2118	9505	1883	9479	1662	9450	.8	45
16	2628	9555	2364	9530	2114	9505	1879	9478	1658	9450	.7	44
17	2624	9554	2360	9530	2110	9504	1875	9478	1655	9449	.7	43
18	2619	9554	2355	9530	2106	9504	1871	9478	1651	9449	.7	42
19	2615	9554	2351	9529	2102	9504	1868	9477	1648	9448	.7	41
20	2610	9553	2347	9529	2098	9503	1864	9477	1644	9448	.7	40
21	2606	9553	2343	9528	2094	9503	1860	9476	1641	9447	.7	39
22	2601	9552	2338	9528	2090	9502	1856	9475	1637	9447	.6	38
23	2597	9552	2334	9527	2086	9502	1853	9475	1634	9446	.6	37
24	2592	9552	2330	9527	2082	9501	1849	9474	1630	9446	.6	36
25	2588	9551	2326	9527	2078	9501	1845	9474	1627	9445	.6	35
26	2583	9551	2321	9526	2074	9500	1841	9473	1623	9445	.6	34
27	2579	9550	2317	9526	2070	9500	1838	9473	1619	9444	.6	33
28	2574	9550	2313	9525	2066	9500	1834	9473	1616	9444	.5	32
29	2570	9550	2309	9525	2062	9499	1830	9472	1612	9443	.5	31
30	2565	9549	2304	9525	2058	9499	1826	9472	1609	9443	.5	30
31	2561	9549	2300	9524	2054	9498	1823	9471	1605	9443	.5	29
32	2556	9548	2296	9524	2050	9498	1819	9471	1602	9442	.5	28
33	2552	9548	2292	9523	2046	9497	1815	9470	1598	9442	.5	27
34	2547	9548	2287	9523	2042	9497	1811	9470	1595	9441	.4	26
35	2543	9547	2283	9522	2038	9497	1808	9469	1591	9441	.4	25
36	2539	9547	2279	9522	2034	9496	1804	9469	1588	9440	.4	24
37	2534	9546	2275	9522	2030	9496	1800	9468	1585	9440	.4	23
38	2530	9546	2271	9521	2026	9495	1796	9468	1581	9439	.4	22
39	2525	9546	2266	9521	2022	9495	1793	9467	1578	9439	.4	21
40	2521	9545	2262	9520	2018	9494	1789	9467	1574	9438	.3	20
41	2516	9545	2258	9520	2014	9494	1785	9466	1571	9438	.3	19
42	2512	9544	2254	9519	2011	9493	1782	9466	1567	9437	.3	18
43	2508	9544	2250	9519	2007	9493	1778	9466	1564	9437	.3	17
44	2503	9544	2246	9519	2003	9493	1774	9465	1560	9436	.3	16
45	2499	9543	2241	9518	1999	9492	1771	9465	1557	9436	.3	15
46	2494	9543	2237	9518	1995	9492	1767	9464	1553	9435	.2	14
47	2490	9542	2233	9517	1991	9491	1763	9464	1550	9435	.2	13
48	2485	9542	2229	9517	1987	9491	1760	9463	1547	9434	.2	12
49	2481	9541	2225	9516	1983	9490	1756	9463	1543	9434	.2	11
50	2477	9541	2221	9516	1979	9490	1752	9462	1540	9433	.2	10
51	2472	9541	2216	9516	1975	9489	1749	9462	1536	9433	.2	9
52	2468	9540	2212	9515	1971	9489	1745	9461	1533	9432	.1	8
53	2464	9540	2208	9515	1968	9488	1741	9461	1529	9432	.1	7
54	2459	9539	2204	9514	1964	9488	1738	9460	1526	9431	.1	6
55	2455	9539	2200	9514	1960	9488	1734	9460	1523	9431	.1	5
56	2450	9539	2196	9513	1956	9487	1730	9459	1519	9430	.1	4
57	2446	9538	2192	9513	1952	9487	1727	9459	1516	9430	.1	3
58	2442	9538	2188	9513	1948	9486	1723	9458	1512	9429	.0	2
59	2437	9537	2183	9512	1944	9486	1719	9458	1509	9429	.0	1
60	2433	9537	2179	9512	1940	9485	1716	9458	1506	9428	.0	0
	109°		108°		107°		106°		105°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	75°		76°		77°		78°		79°		Corr. Z″	
	h_c 75°	Z″ 14°	h_c 76°	Z″ 13°	h_c 77°	Z″ 12°	h_c 78°	Z″ 11°	h_c 79°	Z″ 10°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	1506	9428	1310	9397	1128	9363	960	9327	805	9289	1.0	60
1	1502	9428	1306	9396	1125	9363	957	9327	803	9288	1.0	59
2	1499	9427	1303	9396	1122	9362	954	9326	800	9287	1.0	58
3	1495	9427	1300	9395	1119	9362	952	9326	798	9287	1.0	57
4	1492	9426	1297	9395	1116	9361	949	9325	796	9286	.9	56
5	1489	9426	1294	9394	1113	9360	946	9324	793	9285	.9	55
6	1485	9425	1291	9394	1110	9360	944	9324	791	9285	.9	54
7	1482	9425	1288	9393	1107	9359	941	9323	788	9284	.9	53
8	1479	9424	1285	9392	1104	9359	938	9322	786	9283	.9	52
9	1475	9423	1281	9392	1102	9358	936	9322	783	9283	.9	51
10	1472	9423	1278	9391	1099	9358	933	9321	781	9282	.8	50
11	1469	9422	1275	9391	1096	9357	930	9321	779	9281	.8	49
12	1465	9422	1272	9390	1093	9356	928	9320	776	9280	.8	48
13	1462	9421	1269	9390	1090	9356	925	9319	774	9280	.8	47
14	1459	9421	1266	9389	1087	9355	922	9319	771	9279	.8	46
15	1455	9420	1263	9389	1084	9355	920	9318	769	9278	.8	45
16	1452	9420	1260	9388	1081	9354	917	9317	767	9278	.7	44
17	1449	9419	1257	9388	1079	9353	914	9317	764	9277	.7	43
18	1445	9419	1254	9387	1076	9353	912	9316	762	9276	.7	42
19	1442	9418	1250	9386	1073	9352	909	9316	759	9276	.7	41
20	1439	9418	1247	9386	1070	9352	907	9315	757	9275	.7	40
21	1435	9417	1244	9385	1067	9351	904	9314	755	9274	.7	39
22	1432	9417	1241	9385	1064	9351	901	9314	752	9274	.6	38
23	1429	9416	1238	9384	1062	9350	899	9313	750	9273	.6	37
24	1426	9416	1235	9384	1059	9349	896	9312	748	9272	.6	36
25	1422	9415	1232	9383	1056	9349	894	9312	745	9271	.6	35
26	1419	9415	1229	9383	1053	9348	891	9311	743	9271	.6	34
27	1416	9414	1226	9382	1050	9348	888	9310	740	9270	.6	33
28	1412	9414	1223	9381	1047	9347	886	9310	738	9269	.5	32
29	1409	9413	1220	9381	1045	9346	883	9309	736	9269	.5	31
30	1406	9413	1217	9380	1042	9346	881	9308	733	9268	.5	30
31	1403	9412	1214	9380	1039	9345	878	9308	731	9267	.5	29
32	1399	9412	1211	9379	1036	9345	876	9307	729	9267	.5	28
33	1396	9411	1208	9379	1033	9344	873	9307	726	9266	.5	27
34	1393	9411	1205	9378	1031	9343	870	9306	724	9265	.4	26
35	1390	9410	1202	9378	1028	9343	868	9305	722	9264	.4	25
36	1386	9410	1199	9377	1025	9342	865	9305	719	9264	.4	24
37	1383	9409	1196	9376	1022	9342	863	9304	717	9263	.4	23
38	1380	9408	1193	9376	1020	9341	860	9303	715	9262	.4	22
39	1377	9408	1190	9375	1017	9340	858	9303	712	9262	.4	21
40	1373	9407	1187	9375	1014	9340	855	9302	710	9261	.3	20
41	1370	9407	1184	9374	1011	9339	853	9301	708	9260	.3	19
42	1367	9406	1181	9374	1009	9339	850	9301	706	9259	.3	18
43	1364	9406	1178	9373	1006	9338	848	9300	703	9259	.3	17
44	1360	9405	1175	9373	1003	9337	845	9299	701	9258	.3	16
45	1357	9405	1172	9372	1000	9337	843	9299	699	9257	.3	15
46	1354	9404	1169	9371	0998	9336	840	9298	696	9257	.2	14
47	1351	9404	1166	9371	0995	9335	838	9297	694	9256	.2	13
48	1348	9403	1163	9370	0992	9335	835	9297	692	9255	.2	12
49	1344	9403	1160	9370	0989	9334	833	9296	690	9254	.2	11
50	1341	9402	1157	9369	0987	9334	830	9295	687	9254	.2	10
51	1338	9402	1154	9369	0984	9333	828	9295	685	9253	.2	9
52	1335	9401	1151	9368	0981	9332	825	9294	683	9252	.1	8
53	1332	9401	1148	9367	0978	9332	823	9293	681	9251	.1	7
54	1329	9400	1145	9367	0976	9331	820	9293	678	9251	.1	6
55	1325	9399	1142	9366	0973	9331	818	9292	676	9250	.1	5
56	1322	9399	1139	9366	0970	9330	815	9291	674	9249	.1	4
57	1319	9398	1136	9365	0968	9329	813	9291	672	9249	.1	3
58	1316	9398	1133	9365	0965	9329	810	9290	669	9248	.0	2
59	1313	9397	1131	9364	0962	9328	808	9289	667	9247	.0	1
60	1310	9397	1128	9363	0960	9327	805	9289	665	9246	.0	0
	104°		103°		102°		101°		100°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	80°		81°		82°		83°		84°		Corr.	
	h_c 80°	Z″ 9°	h_c 81°	Z″ 8°	h_c 82°	Z″ 7°	h_c 83°	Z″ 6°	h_c 84°	Z″ 5°	Z″	
′	B	D	B	D	B	D	B	D	B	D	°	′
0	665	9246	538	9200	425	9148	325	9089	239	9022	1.0	60
1	663	9246	536	9199	423	9147	323	9088	237	9020	1.0	59
2	660	9245	534	9198	421	9146	322	9087	236	9019	1.0	58
3	658	9244	532	9197	419	9145	320	9086	235	9018	1.0	57
4	656	9243	530	9196	418	9144	319	9085	233	9017	.9	56
5	654	9243	528	9196	416	9143	317	9084	232	9016	.9	55
6	652	9242	526	9195	414	9142	316	9083	231	9014	.9	54
7	649	9241	524	9194	412	9141	314	9082	229	9013	.9	53
8	647	9240	522	9193	411	9140	313	9081	228	9012	.9	52
9	645	9240	520	9192	409	9139	311	9080	227	9011	.9	51
10	643	9239	518	9191	407	9139	310	9079	225	9009	.8	50
11	641	9238	516	9191	405	9138	308	9078	224	9008	.8	49
12	638	9237	514	9190	404	9137	307	9076	223	9007	.8	48
13	636	9237	512	9189	402	9136	305	9075	222	9006	.8	47
14	634	9236	510	9188	400	9135	304	9074	220	9004	.8	46
15	632	9235	508	9187	399	9134	302	9073	219	9003	.8	45
16	630	9234	506	9186	397	9133	301	9072	218	9002	.7	44
17	628	9234	505	9186	395	9132	299	9071	217	9000	.7	43
18	625	9233	503	9185	393	9131	298	9070	215	8999	.7	42
19	623	9232	501	9184	392	9130	296	9069	214	8998	.7	41
20	621	9231	499	9183	390	9129	295	9068	213	8997	.7	40
21	619	9231	497	9182	388	9128	293	9067	212	8995	.7	39
22	617	9230	495	9181	387	9127	292	9066	210	8994	.6	38
23	615	9229	493	9181	385	9126	290	9064	209	8993	.6	37
24	612	9228	491	9180	383	9125	289	9063	208	8991	.6	36
25	610	9227	489	9179	382	9124	287	9062	207	8990	.6	35
26	608	9227	487	9178	380	9123	286	9061	205	8989	.6	34
27	606	9226	485	9177	378	9122	284	9060	204	8988	.6	33
28	604	9225	483	9176	376	9121	283	9059	203	8986	.5	32
29	602	9224	482	9175	375	9120	282	9058	202	8985	.5	31
30	600	9224	480	9175	373	9119	280	9057	200	8984	.5	30
31	598	9223	478	9174	371	9118	279	9056	199	8982	.5	29
32	596	9222	476	9173	370	9117	277	9054	198	8981	.5	28
33	593	9221	474	9172	368	9116	276	9053	197	8980	.5	27
34	591	9220	472	9171	367	9116	274	9052	196	8978	.4	26
35	589	9220	470	9170	365	9115	273	9051	194	8977	.4	25
36	587	9219	468	9169	363	9114	272	9050	193	8976	.4	24
37	585	9218	467	9168	362	9113	270	9049	192	8974	.4	23
38	583	9217	465	9168	360	9112	269	9048	191	8973	.4	22
39	581	9217	463	9167	358	9111	267	9046	190	8972	.4	21
40	579	9216	461	9166	357	9110	266	9045	188	8970	.3	20
41	577	9215	459	9165	355	9109	264	9044	187	8969	.3	19
42	575	9214	457	9164	353	9108	263	9043	186	8967	.3	18
43	573	9213	455	9163	352	9107	262	9042	185	8966	.3	17
44	571	9213	454	9162	350	9106	260	9041	184	8965	.3	16
45	568	9212	452	9161	349	9105	259	9039	183	8963	.3	15
46	566	9211	450	9160	347	9104	258	9038	181	8962	.2	14
47	564	9210	448	9160	345	9103	256	9037	180	8960	.2	13
48	562	9209	446	9159	344	9102	255	9036	179	8959	.2	12
49	560	9209	444	9158	342	9100	253	9035	178	8958	.2	11
50	558	9208	443	9157	341	9099	252	9034	177	8956	.2	10
51	556	9207	441	9156	339	9098	251	9032	176	8955	.2	9
52	554	9206	439	9155	337	9097	249	9031	175	8953	.1	8
53	552	9205	437	9154	336	9096	248	9030	173	8952	.1	7
54	550	9205	435	9153	334	9095	247	9029	172	8951	.1	6
55	548	9204	434	9152	333	9094	245	9028	171	8949	.1	5
56	546	9203	432	9151	331	9093	244	9026	170	8948	.1	4
57	544	9202	430	9151	330	9092	243	9025	169	8946	.1	3
58	542	9201	428	9150	328	9091	241	9024	168	8945	.0	2
59	540	9201	426	9149	326	9090	240	9023	167	8943	.0	1
60	538	9200	425	9148	325	9089	239	9022	166	8942	.0	0
	99°		98°		97°		96°		95°			

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

	85°		86°		87°		88°		89°		Corr. Z″	
	h_c 85°	Z″ 4°	h_c 86°	Z″ 3°	h_c 87°	Z″ 2°	h_c 88°	Z″ 1°	h_c 89°	Z″ 0°		
′	B	D	B	D	B	D	B	D	B	D	°	′
0	166	8942	106	8845	60	8719	26	8543	7	8242	1.0	60
1	164	8940	105	8843	59	8717	26	8539	6	8235	1.0	59
2	163	8939	104	8841	58	8715	26	8536	6	8227	1.0	58
3	162	8938	103	8839	58	8712	25	8532	6	8220	1.0	57
4	161	8936	102	8837	57	8710	25	8528	6	8212	.9	56
5	160	8935	102	8835	56	8707	24	8525	6	8204	.9	55
6	159	8933	101	8834	56	8705	24	8521	5	8196	.9	54
7	158	8932	100	8832	55	8702	23	8517	5	8188	.9	53
8	157	8930	99	8830	54	8700	23	8513	5	8180	.9	52
9	156	8929	98	8828	54	8697	23	8509	5	8171	.9	51
10	155	8927	97	8826	53	8695	22	8505	5	8163	.8	50
11	154	8926	96	8824	52	8692	22	8501	4	8154	.8	49
12	153	8924	96	8822	52	8689	21	8497	4	8145	.8	48
13	152	8923	95	8820	51	8687	21	8493	4	8136	.8	47
14	150	8921	94	8818	51	8684	21	8489	4	8127	.8	46
15	149	8920	93	8817	50	8682	20	8485	4	8117	.8	45
16	148	8918	92	8815	49	8679	20	8481	4	8107	.7	44
17	147	8917	91	8813	49	8676	19	8477	3	8097	.7	43
18	146	8915	91	8811	48	8674	19	8472	3	8087	.7	42
19	145	8913	90	8809	48	8671	19	8468	3	8077	.7	41
20	144	8912	89	8807	47	8668	18	8464	3	8066	.7	40
21	143	8910	88	8805	46	8665	18	8459	3	8055	.7	39
22	142	8909	87	8803	46	8663	18	8455	3	8044	.6	38
23	141	8907	87	8801	45	8660	17	8451	3	8032	.6	37
24	140	8906	86	8799	45	8657	17	8446	2	8020	.6	36
25	139	8904	85	8797	44	8654	17	8442	2	8008	.6	35
26	138	8902	84	8795	44	8652	16	8437	2	7995	.6	34
27	137	8901	83	8793	43	8649	16	8432	2	7982	.6	33
28	136	8899	83	8791	42	8646	16	8428	2	7969	.5	32
29	135	8898	82	8789	42	8643	15	8423	2	7955	.5	31
30	134	8896	81	8786	41	8640	15	8418	2	7941	.5	30
31	133	8894	80	8784	41	8637	15	8413	2	7926	.5	29
32	132	8893	80	8782	40	8634	14	8408	1	7911	.5	28
33	131	8891	79	8780	40	8631	14	8403	1	7895	.5	27
34	130	8889	78	8778	39	8628	14	8398	1	7879	.4	26
35	129	8888	77	8776	39	8625	13	8393	1	7862	.4	25
36	128	8886	77	8774	38	8622	13	8388	1	7844	.4	24
37	127	8885	76	8772	38	8619	13	8383	1	7825	.4	23
38	126	8883	75	8770	37	8616	12	8378	1	7806	.4	22
39	125	8881	74	8767	37	8613	12	8372	1	7786	.4	21
40	124	8880	74	8765	36	8610	12	8367	1	7765	.3	20
41	123	8878	73	8763	36	8607	11	8361	1	7742	.3	19
42	122	8876	72	8761	35	8604	11	8356	1	7719	.3	18
43	121	8874	71	8759	34	8601	11	8350	1	7694	.3	17
44	121	8873	71	8756	34	8597	11	8345	0	7668	.3	16
45	120	8871	70	8754	33	8594	10	8339	0	7640	.3	15
46	119	8869	69	8752	33	8591	10	8333	0	7610	.2	14
47	118	8868	68	8750	33	8588	10	8327	0	7578	.2	13
48	117	8866	68	8747	32	8585	10	8321	0	7543	.2	12
49	116	8864	67	8745	32	8581	9	8315	0	7505	.2	11
50	115	8862	66	8743	31	8578	9	8309	0	7464	.2	10
51	114	8861	66	8741	31	8575	9	8303	0	7418	.2	9
52	113	8859	65	8738	30	8571	8	8296	0	7367	.1	8
53	112	8857	64	8736	30	8568	8	8290	0	7309	.1	7
54	111	8855	64	8734	29	8564	8	8283	0	7242	.1	6
55	110	8854	63	8731	29	8561	8	8277	0	7163	.1	5
56	109	8852	62	8729	28	8557	8	8270	0	7066	.1	4
57	109	8850	62	8727	28	8554	7	8263	0	6941	.1	3
58	108	8848	61	8724	27	8550	7	8256	0	6765	.0	2
59	107	8846	60	8722	27	8547	7	8249	0	6464	.0	1
60	106	8845	60	8719	26	8543	7	8242	0	------	.0	0
	94°		93°		92°		91°		90°			

If d+b exceeds 90°, prefix (−) to Z″.

The azimuth is reckoned from the north when in north latitude, from the south when in south latitude, toward the east when body is rising or is east of the meridian, toward the west when body is setting or is west of the meridian. **In zero latitude the azimuth takes the name of the declination.**

EXPLANATION OF THE CONSTRUCTION AND USE OF THE TABLES

DEVELOPMENT OF THE FORMULAS

Let us consider the astronomical triangle MPZ (fig. 1) projected upon the plane of the celestial horizon.

Where P is the elevated pole,
Z is the observer's zenith, and
M is any celestial body.

Then the side PZ is equal to the colatitude;
the side PM is equal to the codeclination;
the side ZM is equal to the coaltitude;
the angle at P is equal to the local hour angle, and
the angle at Z is equal to the azimuth of the heavenly body.

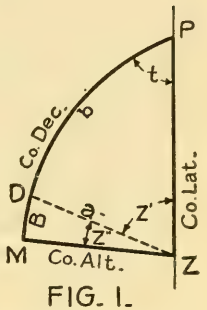

FIG. 1.

Now, let fall a perpendicular ZD from the observer's zenith upon the circle of declination. Call this perpendicular *a*. This will divide the astronomical triangle into two right spherical triangles and the side PM into two parts which we shall call *b* and B respectively. It will also divide the azimuth into two angles Z′ and Z″.

In the upper or "time triangle" (Napier's rules)

$$\text{Sin } a = \cos L \sin t \quad (1)$$
$$\text{Tan } b = \cot L \cos t \quad (2)$$
$$\text{Cot } Z' = \sin L \tan t \quad (3)$$

In the lower or "altitude triangle"—

$$\text{Sin } h = \cos a \cos B \quad (4)$$
$$\text{Cot } Z'' = \sin a \cot B \quad (5)$$

Now, since B is equal to $(90° - d)$ minus $b = 90 - (d + b)$, equations (4) and (5) become

$$\sin h = \cos a \sin (d + b) \quad (6)$$
$$\cot Z'' = \sin a \tan (d + b) \quad (7)$$

Inverting equations (6) and (7) they become—

$$\text{cosec } h = \sec a \text{ cosec } (d + b) \quad (8)$$
$$\tan Z'' = \text{cosec } a \cot (d + b) \quad (9)$$

It is apparent that Z′ plus Z″ is equal to Z, the body's azimuth. This azimuth is always reckoned from the elevated pole east or west from 0° to 180° and marked in the conventional manner depending on the sign of the latitude and whether the body is rising or setting; i. e., east or west of the meridian.

Explanation of the Construction and Use of Tables

CONSTRUCTION OF THE TABLES

Table I.—For every degree of latitude from 0° to 65°, and for every degree of local hour angle from 1° to 90° there is tabluated four columns headed b, A, C, and Z′.

Column b is the value of the side *b* (fig. 1) in degrees, minutes, and tenths. It is found from equation (2).

Column A is the log secant of side *a* (fig. 1) multiplied by 10^5 power. The value of *a* is found from equation (1).

Column C is the log cosecant of side *a*, to three places and multiplied by 10^3 power. It, too, is found from equation (1).

Column Z′ is the value of the angle Z′ (fig. 1) to degrees and tenths. It is found from equation (3).

Table II.—Observe, now, equations (8) and (9). Table I gives us secant a (column A) and cosecant a (column C). All that is necessary to obtain the values of h_o and Z'' is to get the cosecant and cotangent of $(d+b)$. This value of $(d+b)$ is the basis of Table II. It is obtained by finding the algebraic sum of d (the declination) and b (the value found in the first column of Table I).

Table II, then, is merely a log cosecant and cotangent table of angles from 0° to 90° and given for every minute. It contains two columns, B and D.

Column B is the log cosecant of these angles multiplied by 10^5 power.

Column D is the log cotangent of these same angles to three places and multiplied by 10^3 power.

Adding the value of B, taken from Table II, to the value of A, taken from Table I, gives us the log cosecant h_o. (See equation 8). Now, since the first column (B) of Table II is already a log cosecant column, the value of h_o° (the computed altitude) may be found at the top of this column corresponding to its log. The minutes are found to the left of the table.

Similarly, adding the value of D, Table II, to the value of C, taken from Table I, gives us the log tangent of Z''. (See equation 9.) Now, since the second column (D) of Table II is a log cotangent column, and we are dealing with the log tangent Z'', it is but necessary to find this value of the log tangent in column D and the *complement* is the value of Z''. This value of Z'' may be found at the top of the column containing its corresponding log. The tenths of a degree are found to the right of the table.

For simplicity and space, Table I is carried only to 90°. For values over 90°, subtract angle from 180° and enter tables with supplement.

GRAPHIC ILLUSTRATION OF SOLUTION

In equation

(8) Cosec h=sec a cosec $(d+b)$.

(9) Tan Z''=cosec a cot $(d+b)$.

Let A=log sec a.

C=log cosec a.

B=log cosec $(d+b)$.

D=log cot $(d+b)$.

b=natural value of side b in degrees and minutes.

d=declination of body.

Then use the following arrangement for quick solutions:

with t } Enter Table I.

L	d (from Nautical Almanac)	Equation 8	Equation 9	
	b (from Table I)	A (Table I)	C (Table I)	Z′ (Table I)
	$d+b$ (algebraic sum)	B (Table II)	D (Table II)	
	h_o (Table II)	A+B	C+D	Z'' Table II)
				Z= Algebraic sum

EXPLANATION IN DETAIL

1. G. A. T. is found from midnight in the usual manner. From this the G. H. A. is computed as follows: for the sun,

G. H. A.=G. C. T.−12^h±Eq. of T.

For star, planet, or moon,

G. H. A.=G. S. T.−R. A.*

(Add 24^h to the G. S. T. if necessary to perform this subtraction).

2. Convert the G. H. A. to degrees (see short method p. IV).

3. Apply an assumed longitude [minus (−) if west, and plus (+) if east] such that the resultant local hour angle will be an integral degree. If west longitude, subtract the smaller from the larger.

4. With the hour angle (t) and an assumed latitude (use D. R. latitude to nearest degree), enter Table I and pick out quantities b, A, C, Z′.

5. Add algebraically to b the declination obtained from the Nautical Almanac; that is, add if the signs are alike, subtract the smaller from the larger if unlike.

6. With the quantity of $d+b$ thus obtained, enter Table II and pick out quantities B and D. Add B to A and D to C.

7. With A+B enter column B of this same table (Table II) and find the corresponding number. The heading at the top of the column will give the value of h_o in degrees; the minutes will be found in the extreme left column.

8. With C+D enter column D of the same table (Table II) and find the corresponding number. The number at the top of this column will give the value of Z″ in degrees; the tenths of a degree will be found in the extreme right column.

9. Add the Z″ to Z′ previously obtained from Table I to get the azimuth. This azimuth is *always* reckoned from the elevated pole and is marked in the conventional manner, i. e., north when in north latitude, south when in south latitude, east when east of the observer's meridian, west when west of the observer's meridian.

10. The local hour angle (L. H. A.) is reckoned from the upper branch of the meridian westward through 360°.

11. **When the local hour angle or its explement (360°−L. H. A.) is less than 90°, give b the same name as that of the latitude (+) if north, (−) if south. This is called Case I.**

12. **When the local hour angle is between 90° and 270°, give b the opposite name to the latitude.** This is the Case II exemplified in the problems that follow. In it the azimuth is always obtained by subtraction.

When in latitude 0° give b the same name as the declination and the azimuth takes the name of the declination.

NOTES ON SOLUTIONS

13. It will be noted that in Table I, t is used only to 90° (six hours). The manner in which the local hour angle is handled to accomplish this is simple and uniform in all cases.

(a) If the L. H. A. exceeds 90° W., use the supplement as t.

(b) If it exceeds 180° W., reject 180° and use the remainder as t.

(c) If it exceeds 270° W., use the explement as t.

(d) If it exceeds 360°, reject 360°, then treat as in (a).

14. In finding the quantity $d+b$ with which Table II is entered, should this amount exceed 90°, take quantity in degrees from bottom of page and take minutes from right-hand column, reading up. Give the resultant Z″ a negative sign because cot (180°−θ)=(−) cot θ.

15. In finding the azimuth when the value of C+D exceeds 10000, as, for example 13536, the 10000 is dropped and only the number 3536 is sought in Table II.

16. In the following examples the letter a is used to indicate the altitude difference (also called intercept) from the assumed position of the observer TOWARDS the heavenly body, if the true altitude (h) is greater than the computed altitude; AWAY if the true altitude is less than the computed altitude. The true altitude (h)=the observed (or sextant) altitude±all corrections applied.

17. In lieu of a better position the intersection of the perpendicular from the dead-reckoning position at the time of the sight to the line of position obtained with these tables must be taken as the most probable position of the observer on the line.

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18. The difference in the azimuth of the heavenly body due to the adoption of an assumed position differing from the D. R. position may be neglected for nearly all practical cases. However, when high altitudes are observed within an hour of the meridian the correct azimuth can be obtained only by using the data for a point at or near the observer's position. Therefore, under these conditions the assuming of a position to fit the tables may produce an appreciable error in the azimuth, with consequent deflection of the line of position. This source of error may be avoided by interpolating to minutes of latitude within Table I.

19. A study of azimuth tables shows that rapid changes of azimuth occur within an hour of the meridian, and this, coupled with difficulties of observation, makes such azimuths of little value in the accurate determination of compass error. The most favorable time for the determination of compass error is when the heavenly body is low and near the prime vertical (when the body bears to the eastward or westward.)

USE OF THE TABLES

Altitude and Azimuth

Case I (L. H. A. less than 90°; $d+b$ less than 90°).—For the sake of brevity, the corrected observed altitude will be given in each case instead of the sextant altitude, index correction, and height of eye.

Problem 1.—The U. S. S. *Richmond* is making passage from the United States to Montevideo. At about 1650, on March 26, 1928, she was in D. R. position latitude 31° 04′.7 S., longitude 49° 35′.7 W. At this time the sun was observed as follows: Watch $4^h\ 52^m\ 27^s$; C–W. $2^h\ 47^m\ 17^s$; chronometer slow $12^m\ 28^s$; corrected observed altitude 18° 16′.5. Required the line of position.

	h	m	s	
W	4	52	27	
C–W	2	47	17	
	19	39	44	
C. C	(+)	12	28	
G. C. T. 26 Mar	19	52	12	
Eq. T	(−)	5	41.1	
G. A. T	19	46	30.9	
Subtract	12			
G. H. A	7	46	30.9	W.
Arc		116°	37.7′	W.
Ass. long	(−)	49	37.7	W.
L. H. A		67		W.

(Assume a longitude such that the resultant L. H. A. will be an integral degree.)

t 67°
Assumed lat. 31°
(To nearest even degree.)

Enter Table I with $t=67°$, L=31°, and on page 37 pick out for these values the value of b, A, C, and Z′. Combine the value of b thus found with the declination obtained from the Nautical Almanac to obtain $d+b$. (b takes the same sign as the latitude; d and b are added when the signs are alike; subtracted when the signs are unlike.) With the value $d+b$ thus obtained enter Table II and pick out the corresponding values of B and D. These will be found on page 55.

dec. d 2° 21′.0 N.			
fr. Table I b 33° 02′.1 S.	A 21159	C 103	Z′ 39°.5
$d+b$ 30 41.1	B 29216	D 227	
h_c 18° 16′.2	A+B 50375	C+D 330	Z″ 65.0
h_o 18° 16′.5			(Z) S. 104°.5 W.
a 0′.3 (towards)			

Lay off from the assumed position latitude 31°, longitude 49° 37′.7 the bearing (Z) S 104°.5 W., and, at a distance a=0′.3 towards the body on the bearing line, draw a line at right angles to it. This is the required line of position.

Important.—It must not be forgotten that the bearing of the body and the intercept must be laid off from the *assumed* position and not the *dead reckoning* position.

Case I (L. H. A. less than 90°; $d+b$ greater than 90°)—*Problem 2.*—The U. S. S. *Corry* is making passage from San Diego to Honolulu. At evening twilight on December 15, 1928, in D. R. position latitude 24° 30′.9 N., longitude 147° 14′.9 W., the navigator observed the star "Deneb" as follows: W. 5^h 41^m 13^s; C–W. 9^h 51^m 23^s; chronometer slow 8^m 22^s; observed altitude 49° 49′.5. Required the line of position.

	h	m	s	
W	5	41	13	
C–W	9	51	23	
	15	32	36	
C. C	(+)	8	22	
G. C. T. 16 Dec.	3	40	58	
R. A. M. ⊙	5	37	32.7	
T. III		0	36.3	
G. S. T.	9	19	07.0	(Now add 24 hrs. to G. S. T.; illustrates
R. A. ✳	20	38	58.4	note 1.)
G. H. A.	12	40	08.6	
Arc		190°	02′.2 W.	
Assumed λ	(−)	147°	02′.2 W.	
L. H. A.		43°	W.	

t 43° | dec.	45° 01′.6 N.			
Ass. lat. 25° | b	57° 28′.7 N.	A 10453	C 209	Z′ 68°.5
$d+b$	102° 30′.3	B 1043	D 9346	
h_c 50° 07′.4		A+B 11496	C+D 9555	Z″ (−) 19°.8
h_o 49° 49′.5				(Z) N. 48°.7 (W.)
a 17′.9 (away)				

(In this problem $d+b$ exceeds 90°; therefore, take angle 102° from bottom of page 64 of Table II and 30′.3 from right-hand column at side. The resultant Z″ is given a negative sign. This illustrates note 14.)

Case I—Problem 3.—The U. S. S. *Idaho* is making passage from Rio de Janeiro to Cape Town. During evening twilight on September 29, 1928, the navigator observes the star "Rasalhague" as follows: W. $6^h\ 38^m\ 15^s$; C–W. $11^h\ 58^m\ 45^s$; chronometer slow $1^m\ 04^s$; corrected altitude 40° 33′.1. Position by D. R. at time of sight was latitude 30° 57′ S., longitude 0° 08′.6 E. Required the line of position.

	h	m	s	
W	6	38	15	
C–W	11	58	45	
C. F.	6	37	00	
C. C. (+)		1	04	
G. C. T. 29 Sept	18	38	04	
R. A. M. ⊙	0	30	1.3	
T. III		3	3.7	
G. S. T	19	11	09.0	
R. A. ♈	17	31	36.3	
G. H. A	1	39	32.7	W.
To Arc	24°	53′.2		W.
Assumed long (+)	0°	6′.8		E.
L. H. A	25°	0′.0		W.

or,

	h	m	s
G. C. T. 29 Sept.	18	38	04
G. H. A. 29 Sept.	104°	36′.3	
Corr. $18^h\ 38^m$	280	15.9	
Corr. 4^s		1.0	
G. H. A.	24	53.2	W.
Assumed long.	0	6.8	E.
L. H. A.	25	00.0	W.

t 25° dec. 12° 36′.8 N.
Ass. lat. 31° b 56° 27′.4 S. A 3054
$d+b$ 43° 50′.6 B 15946
h_o 40° 13′.0 A+B 19000
h_o 40° 33′.1
a 20′.1 (towards)

C 441 Z′ 76°.5
D 17
C+D 458 Z″ 70.8
(Z) S 147°.3 W

Case I—Problem 4.—A seaplane is making passage from New York to Ponta del Gada, Azores. During evening twilight on June 24, 1928, while in position by D. R. latitude 38° 14′.8 N., longitude 31° 48′.5 W., the navigator observed the moon's lower limb as follows: W. $7^h\ 51^m\ 00^s$; C–W. $2^h\ 08^m\ 29^s$; chronometer fast $8^m\ 31^s$; corrected altitude 48° 39′.1. Required the line of position.

	h	m	s	
W	7	51	00	
C–W	2	08	29	
	9	59	29	
C. C.	(−) 8		31	
G. C. T. 24 June	21	50	58	
R. A. M. ⊙	18	07	35.5	
T. III		3	35.4	
G. S. T	16	02	08.9	
R. A. ☾	12	17	23.0	
G. H. A	3	44	45.9	W.
To Arc		56°	11′.5	W.
Assumed long (−)		31°	11′.5	W.
L. H. A		25°	0′.0	W.

t 25° dec. 3° 22′.6 N.
Ass. lat. 38° b 49° 14′.2 N. A 2553
$d+b$ 52° 36′.8 B 9988
h_c 48° 31′.2 A+B 12541
h_o 48° 39′.1
a 7′.9 (towards)

C 478 Z′ 74°.0
D 9883
C+D 361 Z″ 66.5
(Z) N 140°.5 W.

Case I—Problem 5.—The U. S. S. *Texas* is making passage from San Diego to Valparaiso. During the forenoon of June 25, 1928, while in D. R. position latitude 30° 05′.8 S., longitude 74° 34′.5 W., the navigator observed the sun's lower limb as follows: W. $8^h\ 15^m\ 26^s$; C–W. $5^h\ 07^m\ 12^s$; chronometer fast $7^m\ 42^s$; corrected observed altitude 14° 07′.5. Required the line of position.

	h	m	s	
W	8	15	26	
C–W	5	07	12	
	13	22	38	
C. C (−)		7	42	
G. C. T. 25 June	13	14	56	
Eq. of T (−)		2	25.5	
G. A. T	13	12	30.5	
Subtract	12			
G. H. A	1	12	30.5	W.
Arc	18°	07.6′		W.
Assumed long (−)	74	07.6′		W.
L. H. A	56			E.

t 56° | dec. 23° 23′.8 N.
Ass. lat 30° | b 44° 05′.1 S.

$d+b$ 20° 41′.3

A	15734	C	144
B	45188	D	423
A+B	60922	C+D	567

Z′ 53°.5
Z″ 74.8
(Z) S 128°.3 E

h_c 14° 14′.0
h_o 14° 07′.5
a 6′.5 (away)

Case I—Problem 6.—The U. S. S. *Stewart* is making passage from Hainan, China, to Manila. During the afternoon of May 18, 1928, while in position by D. R. latitude 17° 01′.3 N., longitude 116° 34′ E., the sun's lower limb was observed as follows: W. $4^h\ 00^m\ 10^s$; C–W. $3^h\ 45^m\ 32^s$; chronometer slow $14^m\ 18^s$; corrected observed altitude, 35° 38′.9; sun bore 281° per gyro compass. Required the line of position and the error of the gyro compass.

	h	m	s	
W	4	00	10	
C–W	3	45	32	
	7	45	42	
C. C (+)		14	18	
G. C. T. 18 May	8	00	00	
Eq. of T		+3	43.1	
G. A. T	8	03	43.1	(add 24 hrs.)
Subtract	12			
G. H. A	20	03	43.1	W.
Arc	300°	55.8′		W.
Assumed long (+)	116	04.2′		E.
L. H. A	417°			W.
(Reject)	360°			
t	57			W. (illustrates Note 13(d))

t 57°	dec. 19° 31′.4 N.				
Ass. lat. 17°	b 60° 41′.6 N.	A 22381	C 96	Z′ 65°.8	
$d+b$ 80 13.0		B 636	D 9237		
h_c 36° 03′.5		A+B 23017	C+D 9333	Z″ 12.2	
h_o 35° 38′.9					
				Z (N.) 78.0 (W.)	
				Z 282°	
a 24′.6 (away)				Z 281 (pgc.)	
				Error pgc. 1° (E.)	

Case II (L. H. A. between 90° and 270°)—*Problem 7.*—On May 15, 1928, about 8 p. m., the U. S. S. *Mississippi* making passage from Hampton Roads to Liverpool, while in D. R. position, latitude 40° 43′ N., longitude 68° 30′ W., observed the star Vega as follows: W. $7^h\ 36^m\ 12^s$, C–W. $4^h\ 59^m\ 12^s$, chronometer $1^m\ 1^s$ slow. True altitude 14° 50.5′.

	h	m	s			h	m	s
W	7	36	12					
C–W	4	59	12					
C. F	12	35	24					
C. C	(+) 1	01						
G. C. T. 16 May	0	36	25	or,	G. C. T. 16 May	0	36	25
R. A. M. S. ⊙	15	33	49.7		G. H. A. 16 May	314°	49′.6	
Corr. G. C. T., Tab. III			6.0		Corr. $0^h\ 36^m$	9	01.5	
					Corr. 25^s		6.3	
G. S. T	16	10	20.7		G. H. A.	323	57.4	
R. A. ✳	18	34	31.3		Assumed long.	68	57.4	
G. H. A	21	35	49.4 W.		L. H. A.	255	00.0	
Arc	323°	57.4′ W.						
Assumed long. (−)	68°	57.4 W.						
L. H. A	255°	W. (or 105° E.)						
Reject	180°							
t	75°	(illustrates Note 13 *b*.)						

t=75° | Enter Table I with t=75°. L=41° (page 41).
L=41° | Find *b*, A, C, and Z′. *b* is given sign opposite to that of latitude (see Note 12).
Combine *b*, with declination and always subtract.
With value $d+b$ enter Table II, pick out values B and D.
Add A+B and C+D. Change Z′ to (−). (See Note 12.)

Dec. d 38° 42.7′ N.					
Tab. I b 16° 34.8′ S.	A 16461	C 137	Z′ (−) 22°.2		
(Subtract) $d+b$ 22 07.9	B 42396	D 391			
h_c 14° 56.7′	A+B 58857	C+D 528	Z″ 73°.5		
h_o 14 50.5			Z N 51°.3 E.		
a 6.2′ (away)					

Case II (L. H. A. between 90° and 270°)—*Problem 8.*—On June 22, 1928, about 6 p. m., the U. S. S. *West Virginia* in D. R. position lat. 50° 55′ N., long. 30° W., observed the sun's lower limb as follows: Watch $6^h\ 5^m\ 30^s$, C–W. $2^h\ 1^m\ 20^s$, chron. fast $0^m\ 20^s$. True alt. 17° 14.5′. Required line of position.

	h	m	s	
W	6	5	30	
C–W	2	1	20	
Chro. F	8	6	50	
C. C (−)		0	20	
G. C. T. 22 June	20	6	30	
Eq. t (−)		1	50.6	
G. A. T	20	4	39.4	
Subtract	12			
G. H. A	8	4	39.4	W.
Arc	121°	9.8′		W.
Assum. long (−)	30°	9.8′		W.
L. H. A	91°	00′		W. (illustrates Note 13 (*a*).)
	180°			
t	89°			

t 89° $\backslash d$ 23° 26.7′ N.
L 51 $/b$ 0 48.6′ S.

$d+b$ 22 38.1

h_c 17° 24.2′
h_o 17 14.5

a 9.7′ (away)

A 10946 | C 201 | Z′ − 1°3
B 41470 | D 380
A+B 52416 | C+D 581 | Z″ 75°3
Z N. 74.0 W.

MERIDIAN ALTITUDES

A new and short method for working meridian altitudes is here developed. (Refer to fig. 1, p. 67.) When the heavenly body is on the meridian, t equals zero. The side a becomes zero, and point D coincides with point Z; b therefore equals the colatitude. Likewise, B will equal the coaltitude. Since B equals co $(d+b)$, it is apparent that $(d+b)$ will equal h (the computed altitude). Hence, whenever $t=0°$ (when the body is on the meridian or near enough to the meridian such that the assumed longitude makes $t=0°$) the work of finding the resultant latitude at the time of the sight is exceedingly simple. Subtract the D. R. latitude from 90°. This value equals b. Apply the declination in the usual manner to get $d+b$. This value of $d+b$ equals the computed altitude (h_c), except in one case when it exceeds 90°, in which case use the supplement as h_c. Applying the observed altitude gives us an altitude difference. Now, the azimuth is assumed to be 0° or 180° according as the observer faces the elevated pole or has his back to the elevated pole when taking the sight. The latitude is thus quickly obtained *without entering the tables.* This method is much more simple than the usual methods of meridian altitudes given in Bowditch. It has the added advantage of disposing of the necessity of remembering confusing signs. An example follows:

Problem 9.—The navigator of the U. S. S. *Raleigh*, on January 11, 1928, in D. R. latitude 15° 08′.6 N., longitude 157° 19′.1 E., observes the sun at L. A. N. as follows: h_s ⊙ 52° 39′; I. C. (+) 1′; height of eye, 41 feet. Required the latitude at L. A. N.

Subtract the D. R. latitude from 90°	90°	00′.0	
	15	08.6	
(This equals b, and takes the same name as the latitude.)	74	51.4	(N.)
Apply the declination	22	01.0	(S.)
The result ($d+b$) equals h_c	52	50.4	
h_o	52	49.4	
a equals		1′.0	(away.)

Z=180° since the observer's back is toward the elevated pole. ∴ the resulting latitude equals 15° 08′.6+1′.0=15° 09′.6 N.

Problem 10.—The U. S. S. *Los Angeles* while making passage from Midway Islands to Shanghai was at L. A. N., on July 22, 1928, in D. R., position latitude 28° 40′ N., 175° 14′ E. The navigator observed the sun for latitude as follows: h_s ⊙ 82° 06′; I. C. (−) 1′; height of eye, 1,050 feet. Required the latitude at L. A. N.

	90°	00′	
D. R. lat	28°	40′	N.
b	61°	20′	N.
dec	20°	22′.8	N.
h_c	81	42.8	
h_o	81	49.0	
a		6.2	towards Z 180°

h_s	82° 06′
I. C.	(−) 1′
	82° 05′
Corr. Tab. A. and B.	−16′
True alt	81° 49′

Therefore latitude at L. A. N.=28° 40′ N.−6′.2=28° 33′.8 N.

NOON CONSTANT

If, to the value $d+b$ (or h_c) we apply the index correction and the correction for height of eye for this h_c with reversed signs, we thereby obtain a noon constant K. At L. A. N. simply observe the sun's altitude and apply to K thus obtained to get the altitude difference. This method eliminates the necessity of finding an approximate altitude with which to find the height of eye correction. It also eliminates confusing signs.

Problem 11.—In problem 9:

h_c ($d+b$) equals		52°	50′.4
Reverse signs I. C	(−)		1′.0
Height of eye correction	(−)		9′.4
(#) Noon constant (K)		52°	40′.0
Sextant altitude		52°	39′.0
		a=1′.0	(away) 180°

REDUCTION TO THE MERIDIAN

(Near meridian)

The method of finding altitude and azimuth as set forth in these tables is accurate to the time of meridian passage when the altitude of the observed body is less than 75°.

When a sight is reduced to the meridian, the resultant latitude is not the latitude at meridian passage, but is the latitude at the time of taking the sight. (See Bowditch, 1933, art. 330.) With this method a line of position is quickly obtained; and, should the intercept be sufficiently small and the azimuth close to 0° or 180°, we have practically a latitude line of position at the time the sight is taken.

Problem 12.—On June 26, 1928, about noon, the U. S. S. *S–21* in lat. 21 S. long. 60° E., by D. R. observed altitude of sun's lower limb bearing northeastward, as follows: Watch $11^h\ 38^m\ 35^s$, C–W. $7^h\ 59^m\ 10^s$, chron. slow $0^m\ 10^s$. True altitude 45° 0′ 0″. Find position line.

	h	m	s	
W	11	38	35	
C–W	7	59	10	
C. F	7	37	45	
C. C			10	
G. C. T., 26 June	7	37	55	
Eq. of T (−)		2	35	
G. A. T	7	35	20	(add 24 hrs.)
Subtract	12			
G. H. A	19	35	20	W.
Arc		293°	50	W.
Long. E (+)		60°	10′	E.
L. H. A		354	00	W. (subtract L. H. A. from 360°) illustrates
or L. H. A		6°		E. Note 13(*c*).

t 6°	*d*	23° 22′.5	N.				
L 21°	*b*	68 53.7	S.	A 208	C 1011	Z′ 87.8°	
	d+*b*	45 31.2		B 14661	D 9992		
h_c=45° 14.5′				A+B 14869	C+D 11003	Z′ 84.3	
h_o=45° 00.0′					(reject 10000) see Note 15.	Z 172°.1	S. and E.
a = 14.5′ away							

The true latitude is on the position line at a point in the correct longitude.

IDENTIFICATION OF AN UNKNOWN STAR

Refer to Figure 1, page 67. In the problem of finding the altitude and azimuth there is given two sides (*d* and L) and an included angle (*t*) of a spherical triangle and it is required to find the third side (*h*) and one other angle (Z). In the problem of identifying an unknown star, there is given two sides (L and *h*) and an included angle (Z) and it is required to find the third side (*d*) and one other angle (*t*) with which to find the body's right ascension. The problems are therefore similar; and, if in the tables we interchange Z for *t*, and *h* for *d*, we may readily identify the unknown body.

Azimuths are reckoned from the north in north latitude, and from the south in south latitude, from 0° to 180° to the east and west of the meridian, so that for any azimuth over 90°, Table I is entered with the supplement, then the sign of b, and t' (used as Z′), become negative values. h is always positive. If $h+b$ is algebraically negative, then d is named contrary to latitude, and t'' (used as Z″) is minus. t is the hour angle named from the initial point north (0°) to the east or west, to agree with the observed bearing of the star. When the algebraic sum of t', and t'' (to give t), is negative, subtract it from 180°; the remainder is the hour angle t, east, or west, of the meridian.

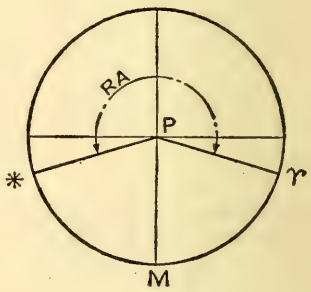
Problem 13.—The U. S. S. *Lardner* is making passage from Colon to the United States. During evening twilight on October 7, 1928, while in D. R. position latitude 15° 05′ N., longitude 76° 40′ W., a star is observed through a break in the clouds and the following data recorded: W. $6^h\ 06^m\ 20^s$; C–W. $5^h\ 10^m\ 06^s$; chronometer fast $10^m\ 06^s$, h_s 20° 55′; I. C. (+)1′; height of eye, 36 feet; bearing of star by gyro, 285° (N. 75° W.). Identify the star.

With Z=75° (used as t) and L=15° enter Table I.

h=20°	47′.6(+)			C	30	t'	46°0
b=44°	0′.4(+)	A	44389				
$h+b$ 64°	48′.0(+)	B	4343	D	9673		
dec. 19° N.	A+B		48732	C+D	9703	t''	26°8

t=72°8=$4^h\ 51^m$ west of meridian, since Z=285°.

	h	m	s
W	6	06	20
C–W	5	10	06
	11	16	26
C. C (−)		10	06
G. C. T., 7 Oct	23	06	20
R. A. M. ⊙	1	01	33.8
T. III		3	47.7
G. S. T	24	11	41.5
Long (−)	5	06	40
L. S. T	19	05	01.5
(Approx.) t	4	51	W.
(Approx.) R. A	14	14	With these enter the Nautical Almanac.
(Approx.) dec (+)	19°		Star is identified as Arcturus.

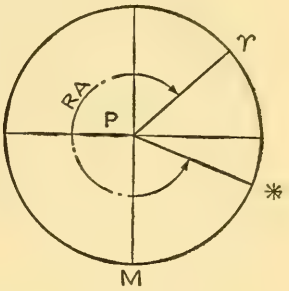


Problem 14 (here Z is over 90° hence b and t' are negative).—The U. S. S. *Argonne* is making passage from Midway Islands to Shanghai. During evening twilight on July 20, 1928, while on D. R. position latitude 28° 18′ N., longitude 179° 47′ W., an unknown star is observed and the following data recorded: W. $7^h\ 16^m\ 24^s$; C–W. $11^h\ 52^m\ 20^s$; chronometer slow $7^m\ 28^s$; I. C. (−) 1′; height of eye, 41 feet; h_s 22° 58′; bearing by gyro 91° (south and east). Identify the star.

Z=91°; since this value is greater than 90° use the supplement as Z. Therefore, with Z=89° (as t) and L=28° enter Table I.

t 89°	h 22° 48.4′ (+)	A 32815	C 54	t' (−) 2°.1
L 28°	b 1 52.8 (−)			
$h+b$ 20 55.6 (+)		B 44712	D 417	
(+) dec. 9° 39′		A+B 77527	C+D 471	t'' 71.3
				t = 69.2=4h 37m E.

	h	m	s
W	7	16	24
C–W	11	52	20
	19	08	44
C. C (+)		7	28
G. C. T., 21 July	7	16	12
R. A. M. ⊙	19	54	02.5
T. III		1	11.6
G. S. T	27	11	26.1
Long (−)	11	59	08
L. S. T	15	12	18.1
(Approx.) t	4	37 E.	



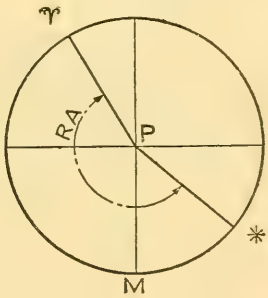
(Approx.) R. A. 19 49 } From Nautical Almanac star is identified as
(Approx.) dec. (+) 9° 39′ } Altair.

Problem 15 (here Z is over 90°, hence b and t' are negative).—A seaplane is making passage from San Juan to Hampton Roads. No sights were available until the morning after departure (November 20, 1928), when, through a break in the clouds "Procyon" and an unknown star were observed. The pilot estimated his D. R. position at the time of sight to be latitude 27° 35′ N., longitude 70° 26′ W. Other data as follows: G. S. T. at time of sight (by G. S. T. watch) 2h 46m 34s; corrected altitude 28° 52′.5; bearing of star 120° (south and east). Required to identify the unknown star.

Z 120°				
Z 60	h 28° 52′.5 (+)	A 19082	C 117	(−) 50°.9
L 28	b 43° 14′.4 (−)			
$h+b$	14° 21′.9 (−)	B 60533	D 592	
d (−) 9° 12′				(−) 78°.9
		A+B 79615	C+D 709	t=(−) 129°.8 (Subtract from 180°)
				t= 50.2=3h 20m 48s E.

	h	m	s
G. S. T	14	46	34
Long (−)	4	41	45
L. S. T	10	04	49
Approx. t	3	20	48 E.
Approx. R. A	13	25	37
Approx. dec (−)		9°	12′

(Star is identified as Spica.)



GREAT CIRCLE COURSE AND DISTANCE

Like all other problems in navigation, this problem can be approached and solved with the same astronomical triangle; i. e., having been given two sides and an included angle, it is required to find the third side and one other angle.

Let L_1 and λ_1 be the latitude and longitude of the point of departure and L_2 and λ_2 be the latitude and longitude of the point of destination, respectively. Now, if in the astronomical triangle we make the following substitutions, we may use these tables with which to solve the problem:

For t substitute the difference of longitude between the two places.

For L substitute L_1 (the latitude of the point of departure).

For d substitute L_2 (the latitude of the point of destination).

Then Z will equal the initial Great Circle course and co h_c will equal the Great Circle distance between the two points. The method of computing the course and co h_c, or $90° \pm h_c$, is given by the following rules:

When t (diff. long.) is less than 90°, both b and Z′ have + signs.

When t (diff. long.) is greater than 90°, both b and Z′ have − signs.

When L_1 and L_2 are in same latitude, L_2 is always plus.

When L_1 and L_2 are in different latitude, L_2 is always minus; combine algebraically L_2 and b, having regard for signs; should the result be less than 90°, give Z″ the same sign, but if L_2+b is greater than 90° give Z″ the opposite sign to L_2+b.

Add algebraically Z′ and Z″, naming the initial course from the elevated pole, if the resultant Z has the plus sign, but name course from the depressed pole if Z has a minus sign.

When L_2+b has a plus sign, the distance is $90°-h_c$.

When L_2+b has a minus sign, the distance is $90°+h_c$.

Problem 16.—Given two places, one in latitude 40° N., longitude 70° W., the other in latitude 30° S., longitude 10° W., find the Great Circle distance between them; also the initial course. Diff. long.=60° (H. A. between 0° and 90°).

t 60°	L_2 30° 00′.0(−)			
L_1 40° N.	b 30° 47′.4(+)	A 12595	C 178	Z′ 41°.9(+)
L_2+b	0 47.4(+)	B 186053	D 1860	
h_c 0° 35′.5		A+B 198648	C+D 2038	Z″ 89°.5(+)
				Course=N. 131. 4 E.

(90°−0° 35′.5=D=89° 24′.5=5,364.5 nautical miles.

Problem 17.—Find the Great Circle distance and initial course between 1° N., 122° W., and 35° N., 139° E. Diff. long.=99° (180°−99°=81°).

t 81°	$=b$ 83° 38.0(−)			
L_1 1°	$=L_2$ 35° 00.0(+)	A 80302	C 5	Z′ 83°.7(−)
L_2+b	48 38 (−)	B 12465	D 9945	Z″ 41.7(−)
h_c=6° 47′		A+B 92767	C+D 9950	Z 125. 4 S. and W. or N. 54. 6° W.

90°+6° 47′=D=96° 47′=5,807 nautical miles.

Problem 18.—Find Great Circle distance and initial course between Cape Town 34° S., 18° E., to New York 40° N., 73° W. Diff. long.=91° (H.A. between 90° and 180°) supplement=89°.

t 89°	L_2 40° 0′.0(−)			
L_1 34 S.	b 1 28.9(−)	A 25229	C 81	Z′ 1.8°(−)
L_2+b	41 28.9(−)	B 17889	D 53	
h_c 21° 44.8′		A+B 43118	C+D 134	Z″ 53.7(−)
				Course N. 55.5 W.

90°+21° 44.8′=111° 44.8′=6,704.8 nautical miles.

LATITUDE BY POLARIS

Problem 19.—On January 26, 1928, p. m., the U. S. S. *S–21* in D. R. lat. 27° N., long. 118° 36′ W., observed Polaris as follows: W. $8^h\ 10^m\ 20^s$; C–W. $7^h\ 23^m\ 10^s$; chron. fast $7^m\ 29^s$. True altitude 27° 50′.1. Find line of position.

	h	m	s	
W	8	10	20	
C–W	7	23	10	
C. F	3	33	30	
C. C (−)		7	29	
G. C. T., 27 Jan	3	26	01	
R. A. M. S. ⊙	8	20	08.7	
Corr. G. C. T			33.8	
G. S. T	11	46	43.5	
R. A. ✳	1	35	28.5	
G. H. A	10	11	15	W.
Arc	152°	48.8′		W.
Long (−)	118	48.8		W.
L. H. A	34			W.

t 34° dec. 88° 55.4 N.
L 27° b 58 25.5 N.
$d+b$ 147 20.9

A 6196 | C 303 | Z′ 73.0°
B 26798 | D 193
A+B 32994 | C+D 496 | Z″−72.3
Z N 0.7° W.

h_c 27° 53.5′
h_o 27° 50.1′

a= 3.4′ (away)

Lat.=27°−3.4′=26° 56.6′ N. (It is the practice to disregard the position line and regard it as a parallel of latitude.)

The line of position is identical with that obtained with Table I a of the Nautical Almanac. (The Nautical Almanac solution is shorter for Polaris.)

The aviator can find from this table the radius of his vision under good weather conditions. It will also aid in estimating the distance of a place within or on his horizon.

Distance of visibility of objects at sea or distance to horizon

Height, in feet	Nautical miles	Statute miles	Height, in feet	Nautical miles	Statute miles	Height, in feet	Nautical miles	Statute miles
1	1. 1	1. 3	100	11. 5	13. 2	760	31. 6	36. 4
2	1. 7	1. 9	105	11. 7	13. 5	780	32. 0	36. 9
3	2. 0	2. 3	110	12. 0	13. 8	800	32. 4	37. 3
4	2. 3	2. 6	115	12. 3	14. 1	820	32. 8	37. 8
5	2. 5	2. 9	120	12. 6	14. 5	840	33. 2	38. 3
6	2. 8	3. 2	125	12. 9	14. 8	860	33. 6	38. 7
7	2. 9	3. 5	130	13. 1	15. 1	880	34. 0	39. 2
8	3. 1	3. 7	135	13. 3	15. 3	900	34. 4	39. 6
9	3. 5	4. 0	140	13. 6	15. 6	920	34. 7	40. 0
10	3. 6	4. 2	145	13. 8	15. 9	940	35. 2	40. 5
11	3. 8	4. 4	150	14. 1	16. 2	960	35. 5	40. 9
12	4. 0	4. 6	160	14. 5	16. 7	980	35. 9	41. 3
13	4. 2	4. 8	170	14. 9	17. 2	1, 000	36. 2	41. 7
14	4. 3	4. 9	180	15. 4	17. 7	1, 100	38. 0	43. 8
15	4. 4	5. 1	190	15. 8	18. 2	1, 200	39. 6	45. 6
16	4. 6	5. 3	200	16. 2	18. 7	1, 300	41. 3	47. 6
17	4. 7	5. 4	210	16. 6	19. 1	1, 400	42. 9	49. 4
18	4. 9	5. 6	220	17. 0	19. 6	1, 500	44. 4	51. 1
19	5. 0	5. 8	230	17. 4	20. 0	1, 600	45. 8	52. 8
20	5. 1	5. 9	240	17. 7	20. 4	1, 700	47. 2	54. 4
21	5. 3	6. 1	250	18. 2	20. 9	1, 800	48. 6	56. 0
22	5. 4	6. 2	260	18. 5	21. 3	1, 900	49. 9	57. 5
23	5. 5	6. 3	270	18. 9	21. 7	2, 000	51. 2	59. 0
24	5. 6	6. 5	280	19. 2	22. 1	2, 100	52. 5	60. 5
25	5. 7	6. 6	290	19. 6	22. 5	2, 200	53. 8	61. 9
26	5. 8	6. 7	300	19. 9	22. 9	2, 300	55. 0	63. 3
27	6. 0	6. 9	310	20. 1	23. 2	2, 400	56. 2	64. 7
28	6. 1	7. 0	320	20. 5	23. 6	2, 500	57. 3	66. 0
29	6. 2	7. 1	330	20. 8	24. 0	2, 600	58. 5	67. 3
30	6. 3	7. 2	340	21. 1	24. 3	2, 700	59. 6	68. 6
31	6. 4	7. 3	350	21. 5	24. 7	2, 800	60. 6	69. 8
32	6. 5	7. 5	360	21. 7	25. 0	2, 900	61. 8	71. 1
33	6. 6	7. 6	370	22. 1	25. 4	3, 000	62. 8	72. 3
34	6. 7	7. 7	380	22. 3	25. 7	3, 100	63. 8	73. 5
35	6. 8	7. 8	390	22. 7	26. 1	3, 200	64. 9	74. 7
36	6. 9	7. 9	400	22. 9	26. 4	3, 300	65. 9	75. 9
37	6. 9	8. 0	410	23. 2	26. 7	3, 400	66. 9	77. 0
38	7. 0	8. 1	420	23. 5	27. 1	3, 500	67. 8	78. 1
39	7. 1	8. 2	430	23. 8	27. 4	3, 600	68. 8	79. 2
40	7. 2	8. 3	440	24. 1	27. 7	3, 700	69. 7	80. 3
41	7. 3	8. 4	450	24. 3	28. 0	3, 800	70. 7	81. 4
42	7. 4	8. 5	460	24. 6	28. 3	3, 900	71. 6	82. 4
43	7. 5	8. 7	470	24. 8	28. 6	4, 000	72. 5	83. 5
44	7. 6	8. 8	480	25. 1	28. 9	4, 100	73. 4	84. 5
45	7. 7	8. 9	490	25. 4	29. 2	4, 200	74. 3	85. 6
46	7. 8	9. 0	500	25. 6	29. 5	4, 300	75. 2	86. 6
47	7. 9	9. 0	520	26. 1	30. 1	4, 400	76. 1	87. 6
48	7. 9	9. 1	540	26. 7	30. 7	4, 500	76. 9	88. 5
49	8. 0	9. 2	560	27. 1	31. 2	4, 600	77. 7	89. 5
50	8. 1	9. 3	580	27. 6	31. 8	4, 700	78. 6	90. 5
55	8. 5	9. 8	600	28. 0	32. 3	4, 800	79. 4	91. 4
60	8. 9	10. 2	620	28. 6	32. 9	4, 900	80. 2	92. 4
65	9. 2	10. 6	640	29. 0	33. 4	5, 000	81. 0	93. 3
70	9. 6	11. 0	660	29. 4	33. 9	6, 000	88. 8	102. 2
75	9. 9	11. 4	680	29. 9	34. 4	7, 000	96. 0	110. 5
80	10. 3	11. 8	700	30. 3	34. 9	8, 000	102. 6	118. 1
85	10. 6	12. 2	720	30. 7	35. 4	9, 000	108. 7	125. 2
90	10. 9	12. 5	740	31. 1	35. 9	10, 000	114. 6	132. 0
95	11. 2	12. 9						

EXPLANATION OF THE TABLE

This table contains the distances, in nautical and statute miles, at which any object is visible at sea. It is calculated by the formula:

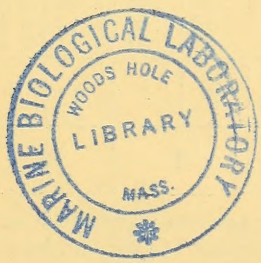
$$d=1.15\sqrt{x}, \text{ and } d'=1.32\sqrt{x},$$

in which d is the distance in nautical miles, d' the distance in statute miles, and x the height of the eye or the object in feet.

To find the distance of visibility of an object, the distance given by the table corresponding to its height should be added to the distance corresponding to the height of the observer's eye.

EXAMPLE: Required the distance of visibility of an object 420 feet high, the observer being at an elevation of 15 feet.

Distance corresponding to 420 feet is	23.5 nautical miles.
Distance corresponding to 15 feet is	4.4 nautical miles.
Distance of visibility	27.9 nautical miles.



Dist. →	1		2		3		4		5		Dist. ←
Course ↓	*l*	*p*	*l*	*p*	*l*	*p*	*l*	*p*	*l*	*p*	Course ↓
°											°
0	1.00	0.00	2.00	0.00	3.00	0.00	4.00	0.00	5.00	0.00	90
1	1.00	.02	2.00	.03	3.00	.05	4.00	.07	5.00	.09	89
2	1.00	.03	2.00	.07	3.00	.10	4.00	.14	5.00	.17	88
3	1.00	.05	2.00	.10	3.00	.16	3.99	.21	4.99	.26	87
4	1.00	.07	2.00	.14	2.99	.21	3.99	.28	4.99	.35	86
5	1.00	.09	1.99	.17	2.99	.26	3.98	.35	4.98	.44	85
6	.99	.10	1.99	.21	2.98	.31	3.98	.42	4.97	.52	84
7	.99	.12	1.99	.24	2.98	.37	3.97	.49	4.96	.61	83
8	.99	.14	1.98	.28	2.97	.42	3.96	.56	4.95	.70	82
9	.99	.16	1.98	.31	2.96	.47	3.95	.63	4.94	.78	81
10	.98	.17	1.97	.35	2.95	.52	3.94	.69	4.92	.87	80
11	.98	.19	1.96	.38	2.94	.57	3.93	.76	4.91	.95	79
12	.98	.21	1.96	.42	2.93	.62	3.91	.83	4.89	1.04	78
13	.97	.22	1.95	.45	2.92	.67	3.90	.90	4.87	1.12	77
14	.97	.24	1.94	.48	2.91	.73	3.88	.97	4.85	1.21	76
15	.97	.26	1.93	.52	2.90	.78	3.86	1.04	4.83	1.29	75
16	.96	.28	1.92	.55	2.88	.83	3.85	1.10	4.81	1.38	74
17	.96	.29	1.91	.58	2.87	.88	3.83	1.17	4.78	1.46	73
18	.95	.31	1.90	.62	2.85	.93	3.80	1.24	4.76	1.55	72
19	.95	.33	1.89	.65	2.84	.98	3.78	1.30	4.73	1.63	71
20	.94	.34	1.88	.68	2.82	1.03	3.76	1.37	4.70	1.71	70
21	.93	.36	1.87	.72	2.80	1.08	3.73	1.43	4.67	1.79	69
22	.93	.37	1.85	.75	2.78	1.12	3.71	1.50	4.64	1.87	68
23	.92	.39	1.84	.78	2.76	1.17	3.68	1.56	4.60	1.95	67
24	.91	.41	1.83	.81	2.74	1.22	3.65	1.63	4.57	2.03	66
25	.91	.42	1.81	.85	2.72	1.27	3.63	1.69	4.53	2.11	65
26	.90	.44	1.80	.88	2.70	1.32	3.60	1.75	4.49	2.19	64
27	.89	.45	1.78	.91	2.67	1.36	3.56	1.82	4.46	2.27	63
28	.88	.47	1.77	.94	2.65	1.41	3.53	1.88	4.41	2.35	62
29	.87	.48	1.75	.97	2.62	1.45	3.50	1.94	4.37	2.42	61
30	.87	.50	1.73	1.00	2.60	1.50	3.46	2.00	4.33	2.50	60
31	.86	.52	1.71	1.03	2.57	1.55	3.43	2.06	4.29	2.58	59
32	.85	.53	1.70	1.06	2.54	1.59	3.39	2.12	4.24	2.65	58
33	.84	.54	1.68	1.09	2.52	1.63	3.35	2.18	4.19	2.72	57
34	.83	.56	1.66	1.12	2.49	1.68	3.32	2.24	4.15	2.80	56
35	.82	.57	1.64	1.15	2.46	1.72	3.28	2.29	4.10	2.87	55
36	.81	.59	1.62	1.18	2.43	1.76	3.24	2.35	4.05	2.94	54
37	.80	.60	1.60	1.20	2.40	1.81	3.19	2.41	3.99	3.01	53
38	.79	.62	1.58	1.23	2.36	1.85	3.15	2.46	3.94	3.08	52
39	.78	.63	1.55	1.26	2.33	1.89	3.11	2.52	3.89	3.15	51
40	.77	.64	1.53	1.29	2.30	1.93	3.06	2.57	3.83	3.21	50
41	.75	.66	1.51	1.31	2.26	1.97	3.02	2.62	3.77	3.28	49
42	.74	.67	1.49	1.34	2.23	2.01	2.97	2.68	3.72	3.35	48
43	.73	.68	1.46	1.36	2.19	2.05	2.93	2.73	3.66	3.41	47
44	.72	.69	1.44	1.39	2.16	2.08	2.88	2.78	3.60	3.47	46
45	.71	.71	1.41	1.41	2.12	2.12	2.83	2.83	3.54	3.54	45
↑ Course	*p*	*l*	*p*	*l*	*p*	*l*	*p*	*l*	*p*	*l*	↑ Course
→ Dist.	1		2		3		4		5		← Dist.

EXPLANATION: Difference of latitude and departure is tabulated for every degree from 0° to 90° and for every mile from 1′ to 10′. To find *l* and *p* for distances greater than 10′ use corresponding multiples.

Thus, to find *l* and *p* for 20′ on course 20°:

l for 2′ = 1.88; for 20′ it equals 18.8.

p for 2′ = .68; for 20′ it equals 6.8.

Dist. →	6		7		8		9		10		Dist. ←
Course ↓	*l*	*p*	*l*	*p*	*l*	*p*	*l*	*p*	*l*	*p*	Course ↓
°											°
0	6.00	0.00	7.00	0.00	8.00	0.00	9.00	0.00	10.00	0.00	90
1	6.00	.10	7.00	.12	8.00	.14	9.00	.16	10.00	.17	89
2	6.00	.21	7.00	.24	8.00	.28	8.99	.31	9.99	.35	88
3	5.99	.31	6.99	.37	7.99	.42	8.99	.47	9.99	.52	87
4	5.99	.42	6.98	.49	7.98	.56	8.98	.63	9.98	.70	86
5	5.98	.52	6.97	.61	7.97	.70	8.97	.78	9.96	.87	85
6	5.97	.63	6.96	.73	7.96	.84	8.95	.94	9.95	1.05	84
7	5.96	.73	6.95	.85	7.94	.97	8.93	1.10	9.93	1.22	83
8	5.94	.84	6.93	.97	7.92	1.11	8.91	1.25	9.90	1.39	82
9	5.93	.94	6.91	1.10	7.90	1.25	8.89	1.41	9.88	1.56	81
10	5.91	1.04	6.89	1.22	7.88	1.39	8.86	1.56	9.85	1.74	80
11	5.89	1.14	6.87	1.34	7.85	1.53	8.83	1.72	9.82	1.91	79
12	5.87	1.25	6.85	1.46	7.83	1.66	8.80	1.87	9.78	2.08	78
13	5.85	1.35	6.82	1.57	7.79	1.80	8.77	2.02	9.74	2.25	77
14	5.82	1.45	6.79	1.69	7.76	1.94	8.73	2.18	9.70	2.42	76
15	5.80	1.55	6.76	1.81	7.73	2.07	8.69	2.33	9.66	2.59	75
16	5.77	1.65	6.73	1.93	7.69	2.21	8.65	2.48	9.61	2.76	74
17	5.74	1.75	6.69	2.05	7.65	2.34	8.61	2.63	9.56	2.92	73
18	5.71	1.85	6.66	2.16	7.61	2.47	8.56	2.78	9.51	3.09	72
19	5.67	1.95	6.62	2.28	7.56	2.60	8.51	2.93	9.46	3.26	71
20	5.64	2.05	6.58	2.39	7.52	2.74	8.46	3.08	9.40	3.42	70
21	5.60	2.15	6.54	2.51	7.47	2.87	8.40	3.23	9.34	3.58	69
22	5.56	2.25	6.49	2.62	7.42	3.00	8.34	3.37	9.27	3.75	68
23	5.52	2.34	6.44	2.74	7.36	3.13	8.28	3.52	9.21	3.91	67
24	5.48	2.44	6.39	2.85	7.31	3.25	8.22	3.66	9.14	4.07	66
25	5.44	2.54	6.34	2.96	7.25	3.38	8.16	3.80	9.06	4.23	65
26	5.39	2.63	6.29	3.07	7.19	3.51	8.09	3.95	8.99	4.38	64
27	5.35	2.72	6.24	3.18	7.13	3.63	8.02	4.09	8.91	4.54	63
28	5.30	2.82	6.18	3.29	7.06	3.76	7.95	4.23	8.83	4.69	62
29	5.25	2.91	6.12	3.39	7.00	3.88	7.87	4.36	8.75	4.85	61
30	5.20	3.00	6.06	3.50	6.93	4.00	7.79	4.50	8.66	5.00	60
31	5.14	3.09	6.00	3.61	6.86	4.12	7.71	4.64	8.57	5.15	59
32	5.09	3.18	5.94	3.71	6.78	4.24	7.63	4.77	8.48	5.30	58
33	5.03	3.27	5.87	3.81	6.71	4.36	7.55	4.90	8.39	5.45	57
34	4.97	3.36	5.80	3.91	6.63	4.47	7.46	5.03	8.29	5.59	56
35	4.91	3.44	5.73	4.02	6.55	4.59	7.37	5.16	8.19	5.74	55
36	4.85	3.53	5.66	4.11	6.47	4.70	7.28	5.29	8.09	5.88	54
37	4.79	3.61	5.59	4.21	6.39	4.81	7.19	5.42	7.99	6.02	53
38	4.73	3.69	5.52	4.31	6.30	4.93	7.09	5.54	7.88	6.16	52
39	4.66	3.78	5.44	4.41	6.22	5.03	6.99	5.66	7.77	6.29	51
40	4.60	3.86	5.36	4.50	6.13	5.14	6.89	5.79	7.66	6.43	50
41	4.53	3.94	5.28	4.59	6.04	5.25	6.79	5.90	7.55	6.56	49
42	4.46	4.01	5.20	4.68	5.95	5.35	6.69	6.02	7.43	6.69	48
43	4.39	4.09	5.12	4.77	5.85	5.46	6.58	6.14	7.31	6.82	47
44	4.32	4.17	5.04	4.86	5.75	5.56	6.47	6.25	7.19	6.95	46
45	4.24	4.24	4.95	4.95	5.66	5.66	6.36	6.36	7.07	7.07	45
↑ Course	*p*	*l*	*p*	*l*	*p*	*l*	*p*	*l*	*p*	*l*	↑ Course
→ Dist.	6		7		8		9		10		← Dist.

To find l and p for 36′ on course 20°:

For 30′ l=28.20 p=10.30
For 6′ l= 5.64 p= 2.05

For 36′ l=33.84 p=12.35

Should the course exceed 90° proceed as follows:

For courses 90° to 180° use 180° minus the course.
For courses 180° to 270° use course minus 180°.
For courses 270° to 360° use 360° minus the course.